Grinding and Finishing

WHEELS • GRINDING • HONING • LAPPING MACHINES • ACCESSORIES • PORTABLE GRINDERS • TUMBLING • ABRASIVES

The Magazine Devoted Exclusively to Abrasive Operations

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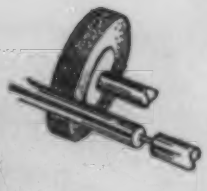

★ FEATURES

Precision Barrel Finishing Practice

Glass Reinforced Abrasive Wheels

Automatic Segment Grinder

ALSO IN THIS ISSUE

Tool and Cutter Grinding Department

Pages From the Notebook

Shop Hints and Kinks

Safety

hitchcock publication

September 1955

Faster grinding...Fewer wheel dressings...Lower costs

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TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

SEP 29 1955

SEPTEMBER, 1955 — VOL. 1, NO. 5

Grinding and Finishing

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EDITORIAL STAFF

William F. Schleicher, editor; *Ronnie Burritt*, consulting technical editor; *Victor G. Morris*, associate editor; *Richard C. Bush* assistant editor; *V. J. Browning*, readers' service.

BUSINESS STAFF

R. C. Van Kampen, president; *Vincent C. Hogren*, executive vice president; *J. E. Hitchcock*, vice president; *Oliver S. Pepper*, business manager; *John S. Todd*, production manager; *L. M. Schroeder*, art director; *Robert L. Spreckels*, circulation manager.

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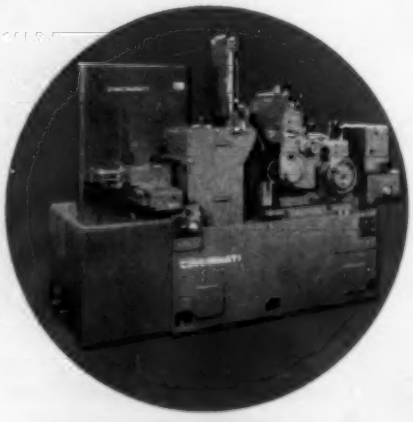
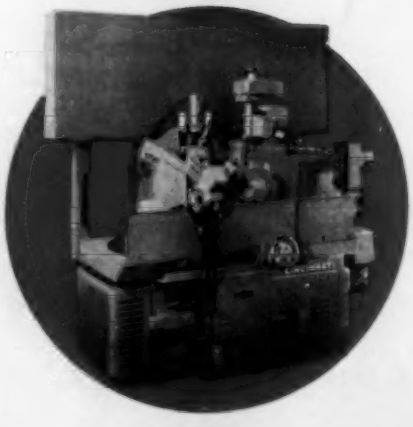
Application for acceptance as controlled circulation publication pending at Pontiac, Illinois.

1205 review of CINCINNATI F
– exhibited at th

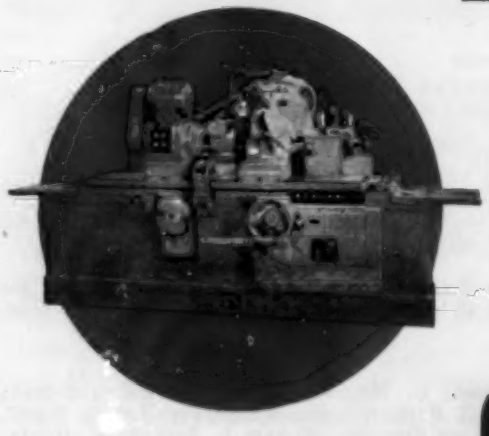
Did you see everything at the recent Machine Tool Show? Did you see how the new equipment could improve quality and reduce manufacturing costs for your products? In the event that you missed something, or perhaps stayed on the job, you'll be interested in this review of six new Cincinnati Filmatic Grinding Machines spotlighted from Cincinnati Milling's 43-machine exhibit.



New CINCINNATI FILMATIC No. 3 Centerless Grinding Machines are completely new from the floor up. Cost-reducing features include anti-friction lower slide; infinitely variable regulating wheel drive; power profile grinding wheel truing; stabilized infeed screw. Extra equipment includes automatic grinding wheel balancing and bar grinding attachments for work up to 24 feet long. Many other attachments are available, including Automatic Infeed, Feedmatic Hoppers, various types of Workrests, etc. Write for catalog No. G-664.



New CINCINNATI FILMATIC Micro-Centric Grinding Machines, like their predecessors, perform the miracle of combining high production with working gage accuracy. New Micro-Centric features include magnetic drive plate which greatly reduces loading time; front handwheel control with fine and coarse adjustment positions; machine mounted cabinet for complete and accessible electrical controls. Ask for catalog No. G-662.



New CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines drastically reduce the cost of precision cylindrical work requiring accurately ground diameters and adjacent shoulders. Both are completed in one automatic infeed cycle. These machines, built in 6"R, 10"L, 10"R and 14"L swing sizes, are equipped with Automatic Grinding Wheel Balancing. Get your copy of catalog No. G-647.

CINCINNATI

CINCINNATI

FILMATIC GRINDING MACHINES

at the Show...

New CINCINNATI FILMATIC Plain Hydraulic Grinding Machines are more convenient to operate and more accurate in performance than ever before. In addition, Automatic Grinding Wheel Balancing, a feature that will pay off handsomely in your shop, is included with standard equipment. The following types of production equipment are available: Push-button Automatic Infeed Attachment; Automatic Gap Eliminator; Behind-the-wheel Profile Truing; Automatic Electric Gage Sizing with Automatic Compensation. Get the complete story in the following catalogs . . . 6"R and 10"L machines, G-660; 10"R and 14"L machines, G-661.

New CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines. New features of productivity and accuracy are incorporated in the new CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines. Pick feed rates are infinitely variable, and may be engaged at the right, left, or both ends of the stroke; the footstock spindle is now chromium plated to prevent wear; headstock speeds are selected with an easy-to-turn dial; rapid cross traverse feature available. Want more information? Ask for catalog No. G-663.

New CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder. Good News—FILMATIC has been added to the name of another Cincinnati machine tool . . . CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder. These famous machines are now equipped with a lifetime spindle unit incorporating FILMATIC bearings. You'll like these features, too . . . the main drive motor is more powerful (1 hp) and built into the wheelhead; the slenderized column requires less floor space; ways for anti-friction slide are hardened and ground. Complete data in catalog No. M-1914.

Of course, Cincinnati builds many more precision grinding machines and cutter and tool grinders than those illustrated here: six Centerless Grinders; Plain, Universal and Roll Grinding Machines from 4" to 60" swing; four Cutter and Tool Grinders, and special grinding machines. There's a size, type and style for your requirements. Would you like to have more information? Write for catalogs on the machines in which you are interested.

THE CINCINNATI MILLING MACHINE CO. • CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

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CORTLAND GRINDING WHEELS
FOR CYLINDRICAL AND CENTERLESS GRINDING

Genuine New England

In the Berkshire Hills, straddling the Boston and Albany Railroad and U. S. Route 20, is the town of Chester, Massachusetts. Since 1850 this community has been associated with abrasives and grinding wheels. Here the knowledge and skill of manufacturers have been passed down from father to son . . . and here today, local pride of good workmanship reflects in Cortland QUALITY.

Quality is a combination of knowledge, skill, never-ending care, and superior manufacturing equipment. In the Cortland plant at Chester, you will find every modern facility to promote uniform quality, as well as speed production.

CORTLAND means an organization flexible enough to give top-management attention to your needs, and large enough to fill those needs. It means an organization old and rich in experience, young and alert to the precise requirements of this fast-moving industry.

For you, Cortland can mean grinding wheel satisfaction!

Three Points

that will make Cortland Wheels perform well for you . . .

The success of Cortland Grinding Wheels in all classes of Cylindrical Grinding can be attributed to three factors:

1. Cortland Salesmen have a thorough knowledge of grinding problems. They get the facts which are essential for correct specifications.
2. Cortland Engineers are experienced, and give close personal supervision to all phases of grinding wheel requirements from specifications through every manufacturing process.
3. Cortland is ready with abrasives and special bonds to meet every exacting requirement . . . and Cortland *controlled* production maintains the right combination of grade and structure to insure correct results.

CORTLAND ABRASIVES AND BONDS

MATERIALS OF HIGH TENSILE STRENGTH

Cortland "A" and "FA" Oxaluma and Type C Vitrified Bond are recommended for materials of high tensile strength. *"A" Oxaluma* is extremely tough and suitable for work requiring heavy pressures and large stock removal.

"FA" Oxaluma is semi-friable and unsurpassed for lighter pressure, fast, free-cutting action.

Type C Vitrified Bond is a product of Cortland research, with a long background of highly satisfactory performance in this field.

* * * *

For high-speed operations, or where certain characteristic grinding action is required, Cortland employs *Type R and H Resinoid Bonds* with these abrasives.

MATERIALS OF LOW TENSILE STRENGTH

Cortland "C" Carbora (Silicon Carbide) and Type A Vitrified Bond is the combination proved and recommended for fast cutting and high production grinding in materials of low tensile strength.

CORTLAND GRINDING WHEEL CORPORATION

Chester, Massachusetts

Large bulletin in colors illustrates and describes these Cortland Grinding Wheels. Glad to send you a copy — free of course.

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HOW TO BUY CUT-OFF WHEELS

FOR CLEANER CUTTING AND LONGER WHEEL LIFE

. . "More Use per Dollar"

Look for a wheel specially engineered and bonded to give you maximum cutting efficiency for your particular cut-off operations.

Safe, fast, clean metal cutting for sustained periods with a wheel that cuts freely, means savings in both time and money. You should look for a wheel that permits you to cut at high speed without burning, one that will leave no burr or discoloration and will last longer. To give you these advantages, the wheel you buy should be custom-bonded for your specific cut-off job . . . to assure smooth, free-cutting action whether you work with hardened or soft steel, light gauge tubing, critical alloys, etc.

Specify the wheel designed specifically for improved cutting on *your* job . . . specify Manhattan Cut-Off Wheels.

MANHATTAN CUT-OFF WHEELS

Manhattan developments in both rubber and resinoid bonds have greatly increased the cutting efficiency and long life of Manhattan Cut-Off Wheels. In factories where records are kept of the number of cuts per wheel, Manhattan wheels have proved they do a better job, longer . . . permit faster, cleaner cutting on *all* types of metals. Manhattan Cut-Off Wheels are manufactured in the widest range of types and sizes. Manhattan sales engineers will aid you in specifying the exact one for your operations and show you how you can save time and money—get "More Use per Dollar"—at your plant with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels.

RM-827

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

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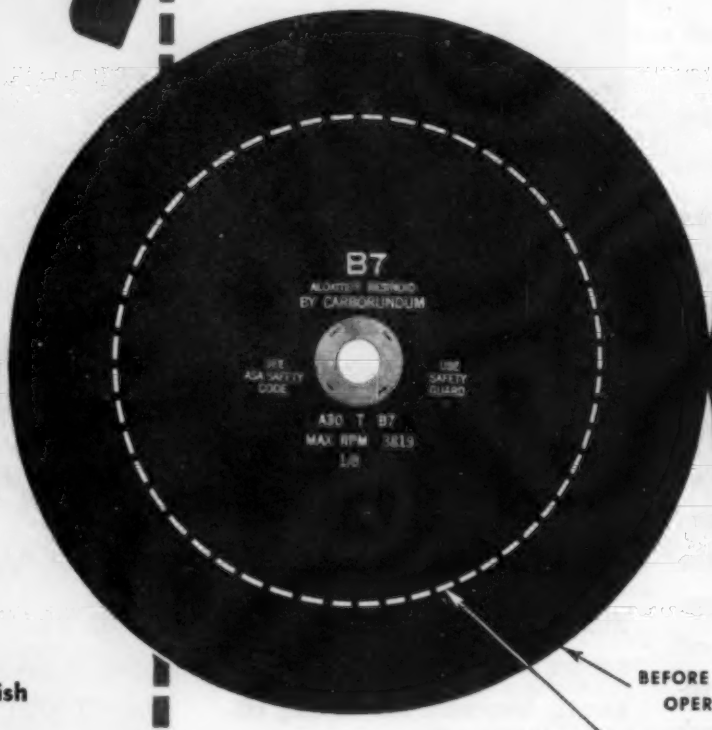
B7 NEW BOND TYPE

★ **LONGER WHEEL LIFE**

with equal quality of finish

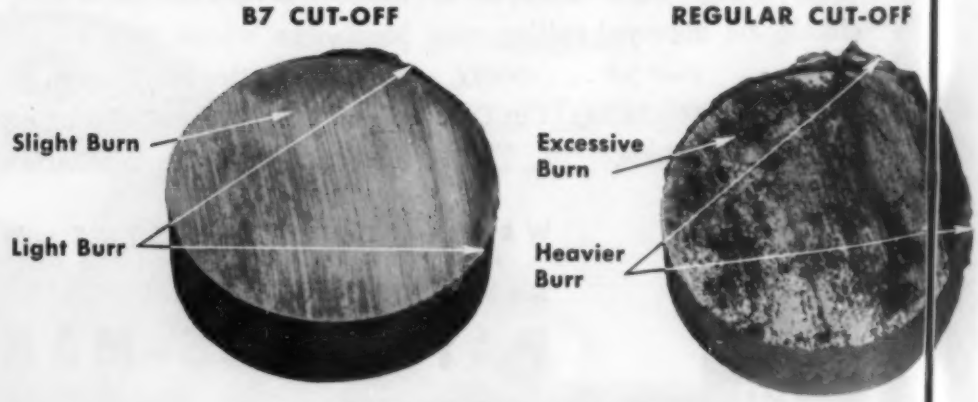


B7 BOND WHEEL

After same number of cuts, B7 outlasts Wheels "A" and "B" by 10-25%.

★ **BETTER QUALITY OF FINISH**

with equal wheel life



COLD ROLLED BAR STOCK, 1⅛" DIAMETER

...continually puts more SENSE in your abrasive DOLLAR

SETS NEW STANDARDS OF PERFORMANCE

FOR ABRASIVE CUT-OFF

WHAT ARE YOU LOOKING FOR in your cutting-off operations... freedom from burn and burr?... close tolerance accuracy?... high production?

Here's a revolutionary new bond type—B7—which is the finest combination yet developed to give you maximum work finish, maximum cut-off speed, and maximum wheel life.

Thousands of these new wheels have been job-proven on work just like yours. The B7 Bond Cut-Off Wheel is *another* CARBORUNDUM development. It's a wheel you'll use with profit!

PLUS NEW FEATURES

NEW distinctive wheel marking —for instant recognition

NEW simplified gradings —R, T, V grades only

NEW rough sides are standard— no need to specify RS on order

TRY ONE YOURSELF!

A simple demonstration in your shop, on any material you're cutting, will convince you that B7 Bond Resinoid Cut-Off Wheels will outperform any other wheels you can use. Call your Carborundum Distributor or salesman to arrange a time most convenient to you. He's listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels."

CARBORUNDUM

REGISTERED TRADE MARK

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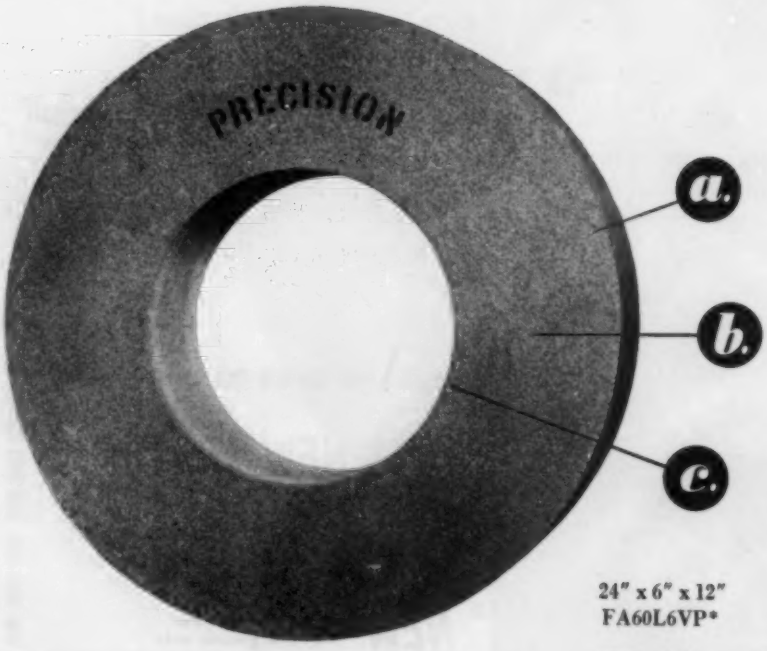
"BIG WHEELS" WITH LONG LIVES



24" x 6" x 12"
FA60L6VP*

*VP—Indicates Progressive Grade Vitrified Wheel.

PROGRESSIVE GRADE CENTERLESS and CYLINDRICAL WHEELS available from 20" to 36" diameter

a. Grade at the periphery is the nominal grade shown on the specifications.

b. At 20" diameter part of the total controlled hardness increase has taken place.

c. At discard size full controlled hardness increase has been built in.

Progressive grade wheels have demonstrated their superiority since their introduction in 1949. Hundreds of applications have proved that the gradual increase in hardness permits the most effective use of the wheel right down to the end. Not only are there significant savings in wheel costs, but overall grinding costs are reduced by fewer dressings and reduced diamond usage.

PROGRESSIVE GRADE wheels are sold at standard list prices and discounts.

Send for our booklet "Modern Trends in Centerless and Cylindrical Grinding."

PRECISION
GRINDING WHEEL COMPANY, INC.
8301 TORRESDALE AVE. • PHILADELPHIA 36, PA.

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High Speed Production Grinding DEMANDS more than just a Coolant!

High speed production grinding has made just *coolants* obsolete! Today's water-mix grinding fluid must provide lubrication, heat dissipation qualities, anti-rust protection and balanced surface tension. If you're using "*just a coolant,*" it's costing you extra money!

Stuart's CODOL is a carefully designed liquid grinding compound that is *far more than just a coolant.* CODOL has been scientifically compounded to provide far more detergency than ordinary water-mix grinding fluids. Wheel loading is greatly reduced and allows more pieces to be ground per wheel dressing.

CODOL's carefully balanced surface tension insures the carrying away of chips and abrasive particles from the wheel, work and machine. Surface finish is improved, production is increased and good wheel life is obtained.

To be sure that you consider *all* of the important points, such as ease of mixing, resistance to rancidity, gumming and foaming, when selecting a water-mix grinding fluid, ask "the Man in the Barrel," your Stuart Representative, to call and help you. And write today for your copy of the Stuart Water-Mix Cutting and Grinding Fluid book.

D. A. STUART OIL COMPANY, LTD.
2729-33 S. Troy St., Chicago 23, Ill.

More than a "Coolant" is Needed

Stuart Oils

Time Tested Cutting Fluids and Lubricants

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

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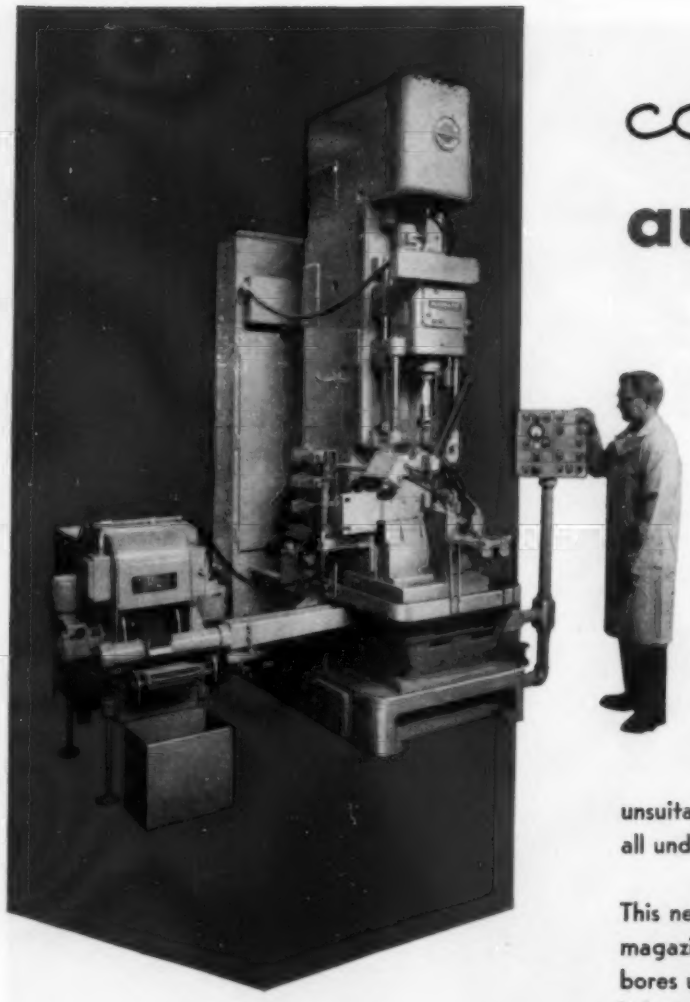
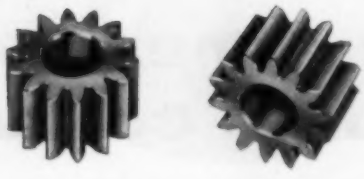


completely automatic honing!

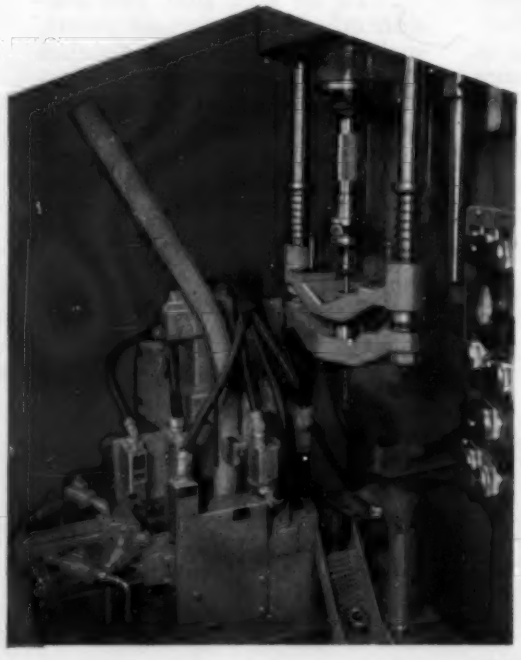
This BARNESDRIL Honing Machine Specially Designed for Continuous Operation with Magazine-Load and Automatic Ejection of Finished Parts.

BarnesdriL engineers have now established bore-finishing operations on a continuous and automatic basis — complete with automatic bore-to-bore sizing, automatic rejection of unsuitable parts, and automatic ejection of finished pieces. — all under Precision control at high production rates.



This new No. 223 BarnesdriL Honing Machine is designed with magazine-feed for loading. It automatically rejects oversize bores unsuited for honing and advances gear to honing position. It hones and sizes to preselected tolerances and finish, and then discharges finished and sized part.

All of these steps are under control of the automatic timed-cycle which successively removes stock, finishes and guarantees precision bore-to-bore sizing. Electronic hone expansion keeps the honing operation always at peak efficiency and automatically compensates for stone wear. Quick-loading type honing stones provide cutting support right up to the cutting edge, for long life and free cutting action.



Performance results in 180 hard steel gears honed per hour at 80% efficiency. Plugmatic sizing holds bore within .0005", and .001"/0015" stock is removed to a finish of 10 RMS.

Why not automate your bore finishing operations in a similar fashion and take advantage of reduced finishing costs through automatic high production and precision control. Call a BarnesdriL engineer, or drop in and talk it over at the Machine Tool Show.

SEE IT IN ACTION BOOTH NO. 818

BARNES DRILL CO.

878 Chestnut Street • Rockford, Illinois

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The Editor's Page

Water Is Fine . . . For Drinking

We've all heard the classic remark, and probably have said it ourselves, "Best coolant for grinding is still good ol' water. Throw in some sal-soda, and you're in business." On many types of grinding operations this is quite true, but on just as many operations this is entirely false.

Research into the theory of grinding and into the theory of coolants is relatively new. While research organizations have dived into coolants for other forms of machining it's only been in recent years that they've gotten their feet wet on the subject of coolants for grinding. To be sure, a number of individual companies have been conducting grinding coolant studies for many years and their voices are being heard; these voices are now swelling into a chorus.

The right coolant can make or break a grinding job. This is especially true with the new materials which are tricky at best; they're even trickier without the proper coolant. On grinding titanium, for instance, dry grinding will give satisfactory results under some circumstances, heavily sulphurized and chlorinated cutting oils are best under others. On the grinding of Alnico oils have performed extremely well. On the grinding of studs from the solid, which we will discuss in a short article next month, a good sulphur base grinding oil must be used to prevent the wheel from breaking down.

The proper coolant can do wonders in eliminating burned surfaces, it helps in the lubrication and reduces frictional heat. Some research organizations have maintained that on some grinding operations a smearing and tearing action takes places, heat from such smearing and tearing action is easily dissipated by increasing the lubricity of the coolant. Others say that grinding forms chips without smear. Both theories are right, it all depends on the job that's being studied and the procedure that's followed. The important consideration is this: look into the coolant with care and just don't throw anything in the machine that happens to be handy.

That there is considerable confusion about the role of coolants in grinding is shown by two accepted textbooks on the subject of grinding. One author tells us that on internal grinding operations a coolant is a must for proper surface finish and for the removal of chips; the other textbook tells us that all internal grinding should be done dry so that the operator can see what's going on. Both books were published within the last five years. It is the better part of valor to consult with the machine builder and the coolant manufacturer for proper procedure for correct recommendations.

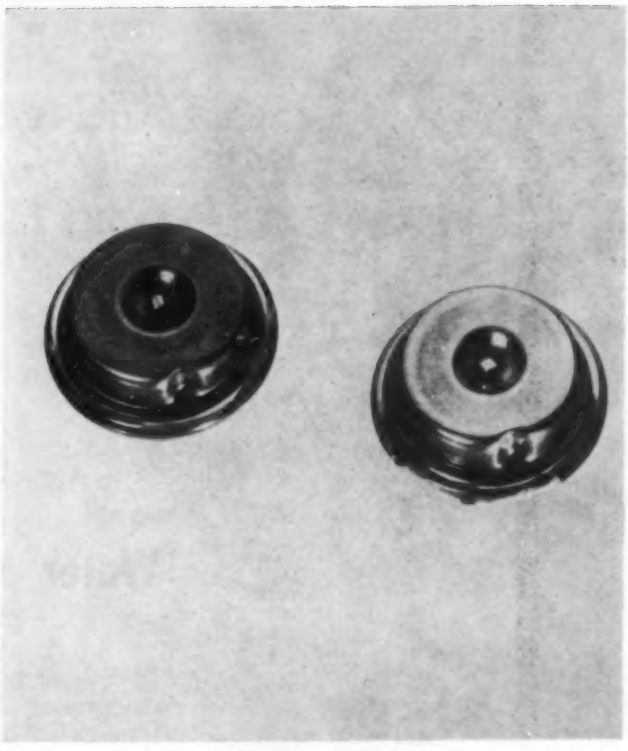
In the matter of surface finish the coolant can make or break the job. Many a fine finish was induced by nothing more brilliant than a change in the type of coolant. We are living with new materials, new standards of finishes, new goals in production, new and pressing cost problems and we must examine every factor that influences any one of these problems. Coolants may be one of the important, and quite frequently overlooked answers.

William F. Schleicher

Yesterday's rough-and-ready method of tumbling has given place to precision barrel finishing. Progress has been spectacular in the past few years; there appears to be no end to the applications and to the results. Records of cost savings, labor savings, and increased production through this method are impressive.

To cover this subject thoroughly GRINDING and FINISHING begins a five-part series on Precision Barrel Finishing in this issue. The five parts will be divided as follows:

1. **Applications and Limitations**
2. **Selection of Equipment**
3. **Media and Compounds**
4. **Methods and Hints to Operators**
5. **Organizing and Operating a Department**



whether it's descaling mercury switches . . .

Industry Cuts Costs, Ups Production

Part 1: Applications and Limitations of Precision Barrel Finishing

By **Morris S. Shipley,** President
and
William A. Biebel, Vice President
Tumbling Sales & Service Co.
Bryam, Conn.

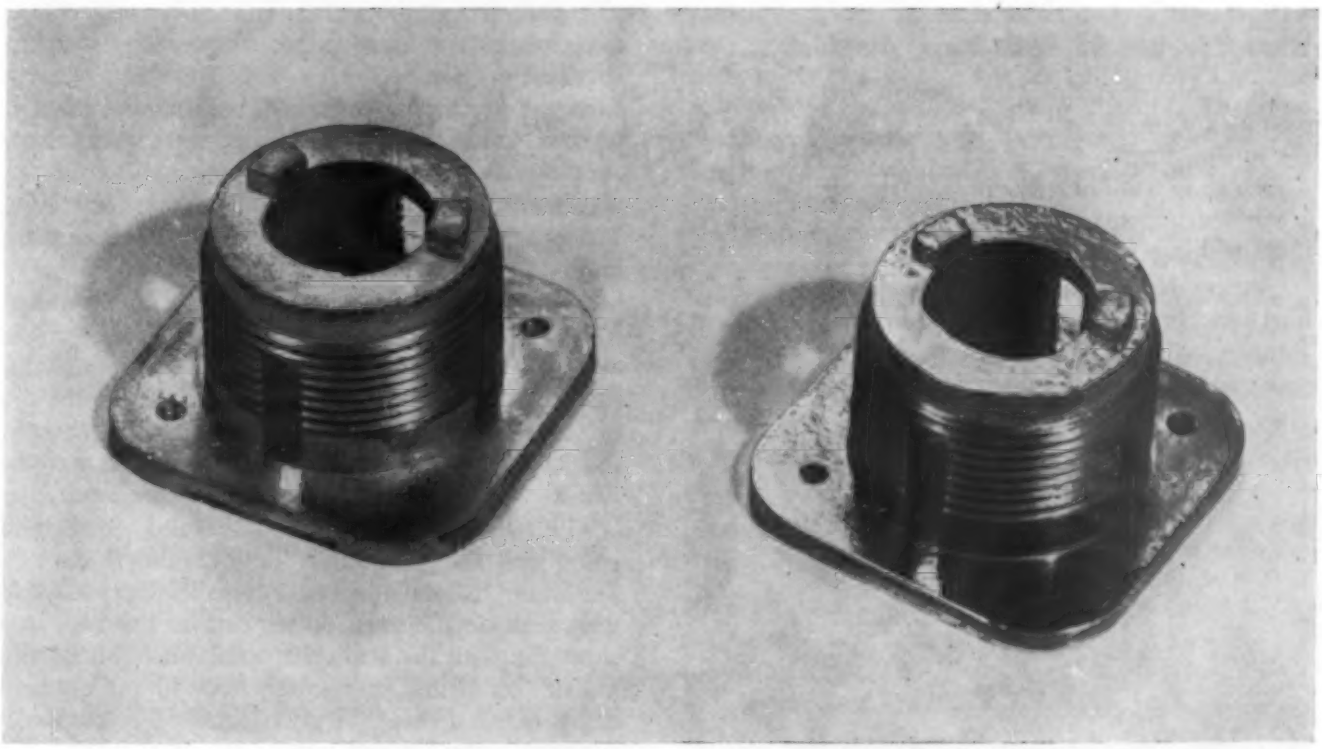
At the end of the current installment is a Glossary of Precision Barrel Finishing terms.

● THE OLD "Rattling Barrel," which many years ago achieved fame in iron foundries, has developed from a rough and tumble arrangement to a high precision machine. Because of new techniques and new processing materials the modern machine is producing results which some production executives still find hard to believe.

A bearings manufacturer, barrel finishing ground outer races without hand labor, is regularly creating a micro-inch finish of 1. In addition, he eliminated the use of cyanide and still achieves ultra-high lustre.

Barrel finishing of the "change-lever" for the B.A.R. rifle eliminated 16 hand filers and resulted in far fewer rejects.

A builder of business machines has from 10 to 20 complicated sliding parts in each machine which must have all edges broken and the surface polished to reduce friction to the ultimate degree. With a production of thousands per day each part had to



or removing burrs from threads of aluminum parts . . .

With Precision Barrel Finishing

be tampico brushed, at a high labor charge. Now, a single tumbling barrel handles that entire production, plus other parts, and surface finish has been greatly improved.

Thin, flat aluminum "pinch clamps" used in controlling the flow in blood transfusions and intravenous injections must have their slits completely burr free to prevent cutting the rubber tubing. Barrel finishing proved the answer and millions of pieces are now processed in this manner.

The threads on an aluminum part of an ordnance component must be completely burr free and must pass through critical thread gauges in final inspection. Tampico brushing was prohibitively expensive. Now hundreds of these are barrel finished at one time and all pass inspection.

Large volumes of mercury switches made of glass and stainless steel, are effectively descaled by barrel finishing. This process reaches depressions which could not be touched by wire brushing.

By another controlled technique, externally threaded zinc die castings are barrel finished to remove burrs and break all edges, inside and out.

These are only a few dramatic examples of what barrel finishing will accomplish in the way of amazing cost reductions, greater uniformity, reduction of rejects, higher production per square foot of floor space, and release of highly paid, skilled personnel to speed up other bottle-necks.

Almost every type of metal can be finished in a barrel. New processing materials and new techniques are producing finishes on zinc and aluminum die castings which were only dreamed of a few short months ago. Copper, brass, the stainless steels, all respond to high lustre burnishing and even magnesium can be cut-down and polished. The jewelry industry has been barrel finishing precious metals for many years.

But barrel finishing is not a panacea. As in every other operation, it has certain limitations which will be discussed a little later.

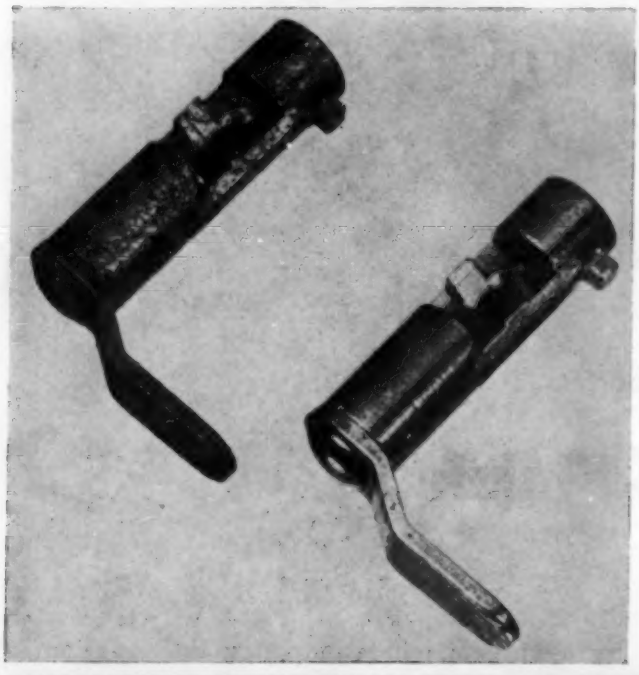
Compliments are due those experts who, through long experience and ingenious methods, have succeeded in satisfactorily barrel finishing very intricate and difficult parts. Details of such special methods, however, can best be covered in specific discussions of the individual problems.

What You Can Do With Barrel Finishing

The basic operations can be divided into four major categories:

Cutting down
Descaling and Brightening
Surface improvement
Burnishing

Cutting down includes both the removal of sharp burrs and breaking of edges. It also includes radius forming, which can be done to specifications. The process can produce either a .002-in. or a .020-in. radius and can do it with great uniformity and few rejects. Furthermore, if parts are uniform coming from the machining operation, barrel finishing will produce uniform radii week after week and month after month.



Change lever for the B.A.R. rifle. Barrel finishing this part saved the time and cost of 16 hand filers. Rejects greatly reduced.

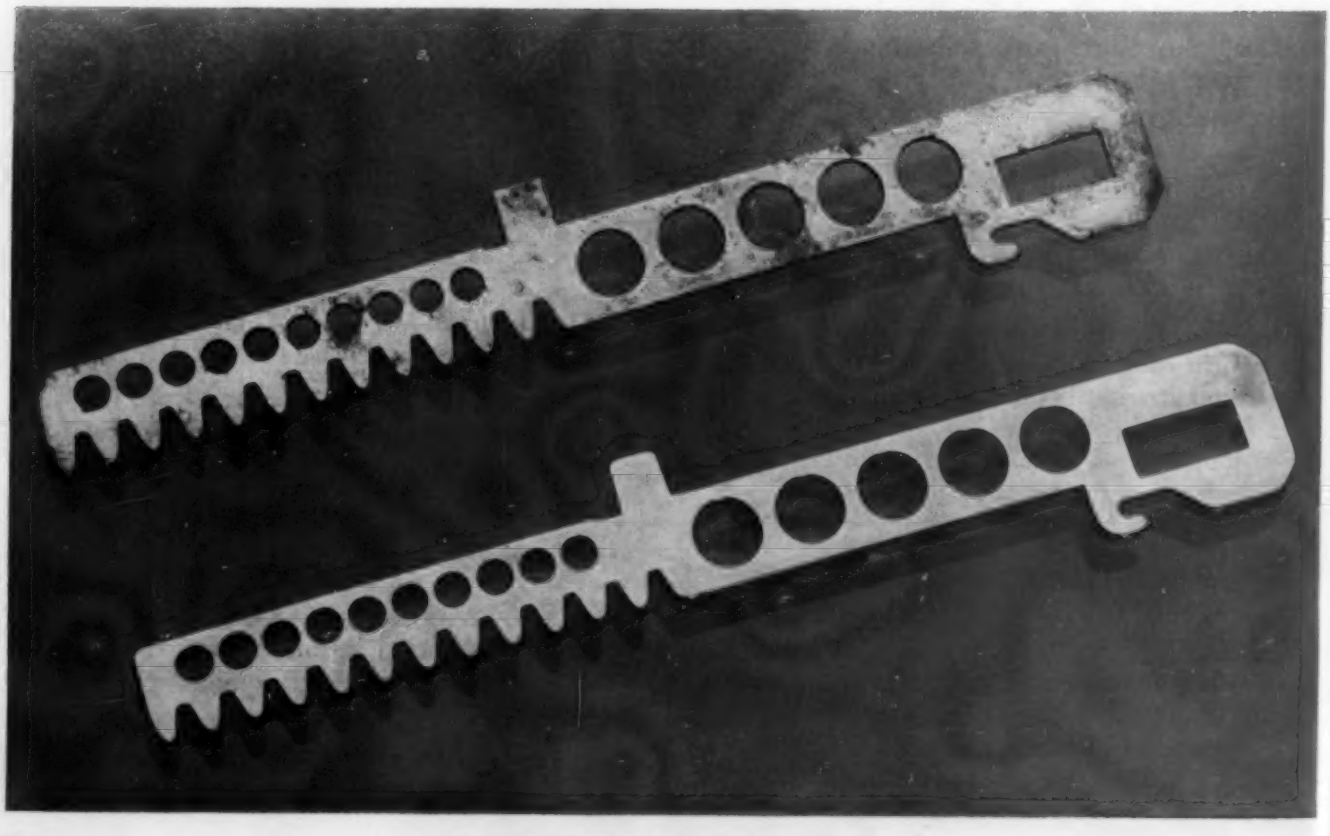
Descaling involves the removal of heat treat scale. This can be done with or without simultaneous stock removal or radius forming.

The desired results can sometimes be accomplished in a self tumbling operation with a special acidic descaling compound which tends to loosen and dissolve the scale. Most cases, however, require the use of abrasive chips with the descaling compound. In this case, the compound loosens the scale and the abrasive chips grind off any stubborn residue.

The same descaling compound is used for brightening ferrous parts after long cut-down runs in aluminum oxide chips. These chips tend to put a dull gray film on the parts which can be removed in a short run with the acid compound. Such a brightening or "bleaching" is essential prior to any burnishing run when this dull gray film has developed.

Details on these and other techniques will be discussed in a later chapter.

Surface improvement is a very loose term which



Business machine part. All edges must be broken and the surface polished to an ultimate finish. Formerly, each part was tampico brushed; now the parts are barrel finished at great savings.

may mean anything from smoothing out the worst of coarse tool and die marks to the creation of ultra low micro-inch finishes. Barrel finishing will accomplish almost any degree of surface improvement and replaces many expensive grinding and polishing operations.

Where micro-inch finishes are involved, barrel finishing will produce smooth surfaces; at the same time, the cost of producing such finishes is small.

Burnishing, also, covers a wide range of results and the terms involved are open to more interpretations than in any other area of barrel finishing. One of the chief confusions arises in the use of such terms as "color" and "lustre." (See the glossary at the end of this chapter).

"Color" means just that and is best illustrated by brass and the other copper alloys. There are red brass, brassy brass, and whitish brass to name but three of the possibilities and all can be produced on the same alloy by a change in the compound and other materials used.

"Lustre," on the other hand, means the brilliance, or light reflectivity of the surface and is not necessarily related to the color of the part. To refer, therefore, to "high color" is not only inaccurate but often is confusing to the man responsible for producing results.

Any type of metal can be burnished to a lesser or greater degree in a tumbling barrel. The degree of brilliance depends on a host of factors including original preparation of surface, type of media used, compound used, height of load, height of water, speed of barrel, proportion of work to media, length of run and, finally, how much cost the part will support in relation to its ultimate value.

Many machined parts, which never show on the outside of a product are cut down in stones and given a cursory burnishing in the same chips. The resultant lustre depends on the size of chip used as well as the other factors mentioned.

As a general rule, it is difficult to produce any appreciable color or lustre in the larger sizes of chips but optimum size depends on type of chip and the part itself.

For ultra high lustre, no other barrel finishing method can equal careful ball burnishing.

The resulting savings from any of the operations mentioned often run so high that the entire cost of the equipment is saved in 6 months or less by reduction in labor costs.

Basic Types of Operations

Barrel finishing operations can be divided into four basic types:

Part on Part
With Chips or Stones
With Metallic Media
Dry Tumbling

Certain parts lend themselves to Part on Part operations, where the parts themeslves provide the mass and act as the carrier for whatever additional medium is employed. With a suitable powdered abrasive compound and water, very effective deburring can be done on all types of metal if the burrs are not too severe or critical.

Certain non-ferrous metals, particularly small sheet brass parts, respond very favorably to self burnishing. In this case, the only thing involved is a small amount of burnishing compound with water.

In both these operations, self tumbling represents the greatest possible economy, as all separating operations are avoided.

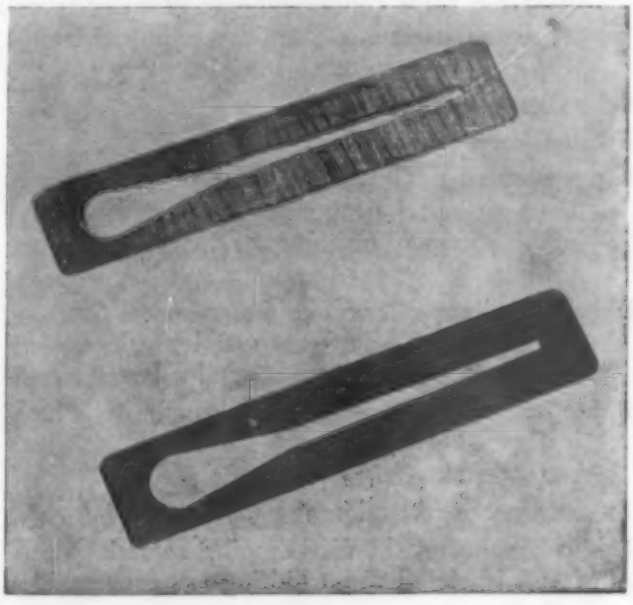
The largest amount of all tumbling done throughout the country involves the use of abrasive stones, or "chips," as they are usually spoken of. But the term "chips" is now used so loosely that it includes almost all media except the metallic types: soft and hard steel, zinc, etc.

The most common types are fused aluminum oxide, bonded aluminum oxide, novaculite (which is Arkansas Stone), limestone, and granite. In addition to these, there are various molded shapes made of a variety of abrasive materials, or completely non-abrasive materials or carriers of powdered abrasives. These, however, are used only in special cases, and are discussed more fully in part 3 .

Without question, more fused aluminum oxide chips are used than any other barrel finishing stone. These are hard and faster cutting than any others on the market. Certain brands are less porous, faster cutting, and have a lesser tendency to fracture than others. It therefore requires careful testing and analysis to determine which will do the best job in a given situation.

Metallic media can be divided into three main

Pinch clamps control the flow of blood in transfusions and intravenous injections. Their slits must be absolutely burr-free to prevent cutting the rubber tubing.



categories; soft steel, for grinding and surface burnishing; hardened steel, for high lustre burnishing; and zinc for certain operations of both types.

These various media will be discussed at greater length in Part 3.

Dry tumbling is very similar, in principle, to self tumbling except that a fair quantity of hard wood sawdust or ground corncob is introduced and the parts rolled rapidly in it. Used largely by electroplaters preparatory to plating, this process removes oil or brings up a lustre on non-ferrous stampings. It is not applicable to machined parts except for the removal of oil.

In all this discussion, there has been little or no mention of the part which barrel finishing compounds play in the production of acceptable results. This will be discussed in Part 3; but it should be pointed out here that without the proper compound, none of the types of tumbling mentioned can produce acceptable results.

Know the Limitations of Barrel Finishing

At this point, it may be well to pause and consider just how far this amazing process can go and what its limitations are. For only by appreciating those limitations can the Methods or Manufacturing Engineer properly evaluate its possibilities in connection with a particular part.

The size and shape of the part is the first consideration. Very large, heavy parts, with critical surfaces or edges, such as heavy ring or spur gears, cannot be tumbled successfully in the conventional manner. The action of the tumbling barrel would cause them to bang against each other and damage edges and surfaces.

Because of the basic nature of the operation, exposed edges and surfaces get the most work. Conversely, shielded areas get little work and inaccessible burrs cannot be removed.

Again, the very weight of the burr itself has a decided influence on the success or failure of the operation. If the burr is exposed and accessible, it can usually be removed if tumbled long enough. But often we see burrs which approach extrusions, because of either the speed of cut or dullness of the cutter. To remove such "extrusions" usually involves such long cycles that other critical dimensions would be affected.

Often in the case of pinion-like parts, the removal of a cut-off burr by tumbling will result in tapering both ends which can't be tolerated.

Certain parts which cannot be tumbled free may be fixtured in the barrel so that they will not damage each other, and a very satisfactory result is obtained. The governing factor here is whether the cost of the special equipment required, plus the labor cost of fixturing and un-fixturing can be justified by the results obtained.

Like all other machining operations, barrel finishing has certain limitations. But these limitations are so few compared to the vast and ever-broadening field which it serves that every metal working plant in the country should make a serious study of where the method may fit in its cost reduction program.

End of Part 1. Part 2 will appear in the October issue. ● ●

GLOSSARY OF BARREL FINISHING TERMS

Abrasive: A loose term applying generally to tumbling chips or stones of all types.

Abrasive Compound: A compound, usually in dry powdered form containing one or more types of abrasive grain and chemicals to lubricate and keep the work clean and bright.

Acid Cleaner: see Descaler.

Alkali Cleaner: see Cleaner.

Barrel Finishing: The mass processing of parts in a tumbling barrel for burr removal, radius forming, micro-inch finishing or high lustre burnishing.

Bleaching: Removal of aluminum oxide film by running with an acid compound after extended cut-down runs to restore natural color of metal.

Bottle Barrel: A special shape of tilting barrel which is shaped like a bottle with a rounded polygonal bottom and a narrow neck or mouth.

Brightening: see Bleaching.

Bright Dipping: A chemical dipping, sometimes performed before ball burnishing to remove oxides and to present fresh, clean surface for the production of the utmost in color.

Burnisher: See Burnishing Compound.

Burnishing: Polishing to improve color and lustre, usually following cut-down runs. Can be applied to operations in any media.

Burnishing Balls: Balls, usually of hardened steel, used with a compound to create a brilliant finish. Many special shapes other than balls are also employed.

Burnishing Barrel: One used primarily for ball burnishing. Originally made of cast iron with hard wood lining. Modern burnishing barrels are usually fabricated of sheet steel with baked on neoprene lining.

Burnishing Compound: A special chemical compound (usually in powdered form) for creating of high color and lustre with either chips or balls.

Charge: Total amount of work, compound, and media loaded in a barrel.

Charging: See impregnation.

Chip Bin: Receptacle for storing media when not in use and from which it may also be discharged into a hoist pan for mechanical loading.

Chips: A generic term to describe all types of stone media, graded to various sizes.

Cleaner: A chemical compound designed to keep parts clean during the cut-down run.

Closed Barrel: A barrel with a watertight cover, usually run in a horizontal position and either hexagonal or octagonal in shape.

Color: The actual color of the metal as differentiated from the lustre or brilliance of the surface.

Compound: Any chemical compound used in barrel finishing operations.

Cut-Down: An abrasive run to deburr, form radius, or remove heavy tool, die or grinding marks.

Cutting Barrel: One used only for deburring and heavy cut-down operations. Usually unlined.

Cycle: The length of time the parts are run.

Deburring: Removal of burrs.

Descaler: An acid type compound used in descaling and brightening.

Descaling: Removal of heat treat scale by running with an acid compound.

Diagonals: Round steel or zinc wire cut at a 45° angle into sections as long as the diameter of the wire.

Dimensional Separator: A mechanical device for separating parts from media which cannot be separated magnetically or by screening. Also for grading chips and for separating part from part.

Dispersion: Distribution of parts within the mass.

Fines: (of abrasive) The fine grains of abrasive which wear off tumbling chips to form sludge in the barrel.

Fixture Barrel: A closed, horizontal barrel having fixtures inside which hold the parts and prevent them from hitting each other. Such barrels usually have multiple doors or a single door composed of two or more flats.

Fracturing: The breaking up of chips during the run.

Glazing: Excessive smoothing for filling of pores of abrasive chips, rendering them ineffective for cutting operations.

Grading: Separation of varying sizes of a media into standard size-ranges by screening or dimensional separation.

Grinding: A barrel finishing operation in which heavy stock removal is required. Usually applied to surface finishing rather than deburring, radius forming, etc.

High Water: Water several inches above the top of the load.

Hoist Pan: Receptacle, mounted on casters, into which tumbling mass is discharged from barrel. Also used for mechanical loading of chips, parts or combined mass into barrel.

Horizontal Barrel: See Closed Barrel.

Impinging: Knocking together of parts in the barrel to cause nicks, darts, or scratches.

Impregnation: Coating or imbedding of parts by abrasive during barrel finishing operation which tends toward (1) excessive tool or die wear on subsequent operations; (2) reduced electrical conductivity; (3) difficulty in burnishing.

Layer on Layer: Method of loading critical parts and media in alternate layers.

Loading: See Glazing.

Lodging: The forcing of media particles into holes or crevices during the barrel finishing operation. Such particles must be removed by mechanical means after the parts have been separated.

Low Water: Water level two or more inches below the level of the load.

Lustre: The reflective brilliance of the surface of the part.

Magnetic Separator: Separating device, usually equipped with an automatic demagnetizer, for separating magnetic parts from non-magnetic media, or vice versa.

Masking: Plugging or covering holes, crevices, etc. to prevent lodging or to protect critical areas.

Mass: The total volume of media and parts in a load.

Medium: Any material which is used to perform work on the parts and which has sufficient bulk to keep the parts from impinging during the run. Usually applied to chips or metallic media.

Micro-inch Finishing: Creation of low micro inch surfaces to specification by special polishing techniques.

Neutralizer: An alkaline compound used to neutralize the load following an acid run.

Neutralizing: Use of an alkaline compound to neutralize the load after bleaching or descaling with an acid compound.

Oblique Barrel: See Tilting Barrel.

Open End Barrel: See Tilting Barrel.

pH: The degre of acidity or alkalinity of the solution in which parts are barrel finished.

Peening: Similar to impinging.

Peen Over: To pound down or roll over burrs, rather than grinding them off.

Polishing: Surface refinement to remove tool, die, or grinding marks.

Radius Forming: Breaking sharp edges and creating radii to meet the customer's specifications.

Reconditioning Chips: The operation by which glazed or loaded chips are restored to more effective cutting condition.

Riddle: Hand screening unit (usually round) for separating work from media or for grading chips.

Rinsing: Flushing the dirt, cuttings, sludge, etc. from

the mass before proceeding to the next operation or before adding a new charge of compound.

Rinsing Door: A perforated tumbling barrel cover to permit rinsing without dumping the load.

Screen Separator: A separating device employing screens of various size openings for separating parts from media.

Separating: The operation of separating parts from media at the end of a run.

Shot: Variously applied to burnishing balls and to extremely fine steel balls, finer than normal burnishing sizes.

Sizing: See Grading.

Slugs: See Diagonals.

Stones: See Chips.

Submerged Barrel: A unit with a horizontal perforated drum which revolves in a tank containing a solution of water and burnishing or cleaning compound. Parts and media are contained in the drum and, theoretically, burrs, foreign matter, sludge from abrasive, etc., drop through the holes and settle to the bottom of the tank.

Tilting Barrel: A barrel with an open end which operates in a tilted position.

Tubbing: A term used by the jewelry trade to describe submerged tumbling. (See Submerged Barrel.)

Tumbling: Often used interchangeably with barrel finishing and rolling.

Tumbling Barrel. A loose term to describe any type of barrel used in barrel finishing.

Wedging: See Lodging.

Besly grinders with automatic clamping feature speed up production of small magnets for country's largest permanent magnet manufacturer.

Automatic Clamping Beats "Hand Fixturing"!

A sizable boost in production of small "U" type Alnico magnets has been made possible at the Indiana Steel Products Co. by the replacement of "hand fixturing" type grinders with Besly Vertical Spindle Wet Type Grinders. Credit for the increased grinding rate goes to the automatic clamping feature of the new machines.

Magnet castings are loaded on a 48-in. dia. rotary feed wheel, automatically clamped in place and revolved beneath a 36-in. dia. Besly-Titan resinoid bonded grinding wheel. After one side of the magnets is ground, they are turned over manually and the second face is ground. Squareness and height are brought to close limits in this operation.

A new Besly grinder with additional automatic operating features has just been installed to grind ring type magnets. Automatic operation of the grinding wheel feed frees the operator for productive loading, unloading and checking duties. After a vertical wheel adjustment for different sized pieces, automatic sizing controls feed the grinding wheel against the work, automatically compensating for wheel wear. An automatically timed spark-out period is provided for the development of final size and finish.

If the grinder is improperly loaded, the rotary table will stop and the grinding wheel rise to its highest position, preventing damage to the machine or work and injury to the operator.

Coolant is supplied against the face of the abrasive wheel at the point of contact with the work. This assures ample cooling where the most heat is generated.

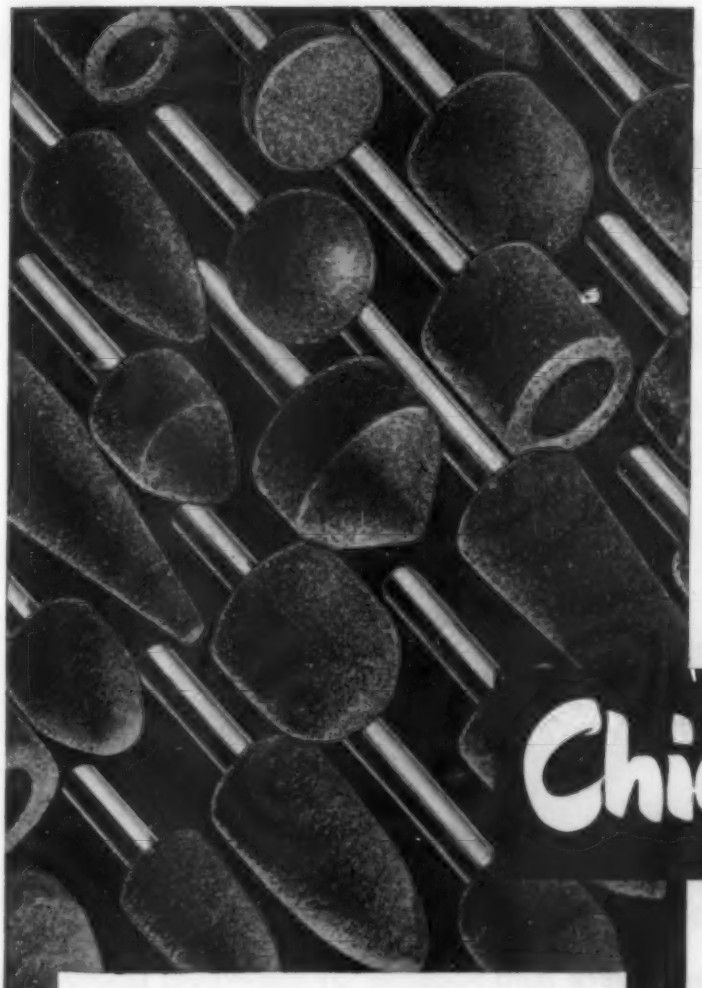
Interchangeable clamping jaws on this new grinder enable it to accommodate many other magnet sizes and shapes with only minor alterations in fixturing. Some of the clamping fixtures are designed to handle several different magnets by simply changing the opening between jaws. ● ●

Chicago Wheel Offers Job Testing Wheels

Chicago Wheel and Manufacturing Co., Chicago, is making an offer of two mounted wheels for actual job testing. These ¼" by ½" straight wheels on ⅛" mandrel are being offered to demonstrate the uniformity of size, shape, grain, grade, and abrasive bond of every Chicago Wheel. Mounted wheels are indispensable for use in tool rooms, machine, pattern and die shops, foundries, and other plants.

Write Chicago Wheel and Manufacturing Company, Dept. GF, 1101 West Monroe Street, Chicago, for test wheels without obligation.

"These modern machines are really wonderful! How did it know this was exactly the part I wanted to make?"



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Chicago mounted wheels will save you time and money on virtually every type of grinding and finishing job. They grind faster and last longer. A complete selection of abrasives, grain sizes, grades and bonds is available. Chicago mounted wheels are perfectly balanced, and guaranteed to remain on their mandrels. Millions are now in use daily in tool rooms, machine, pattern and die shops, foundries, and other plants. No other tool can do the job of Chicago Wheel mounted points.

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MANUFACTURERS OF ABRASIVE PRODUCTS, "HANDEE" PORTABLE GRINDERS, GRINDING WHEELS, AND MOUNTED WHEELS AND POINTS FOR INDUSTRY.

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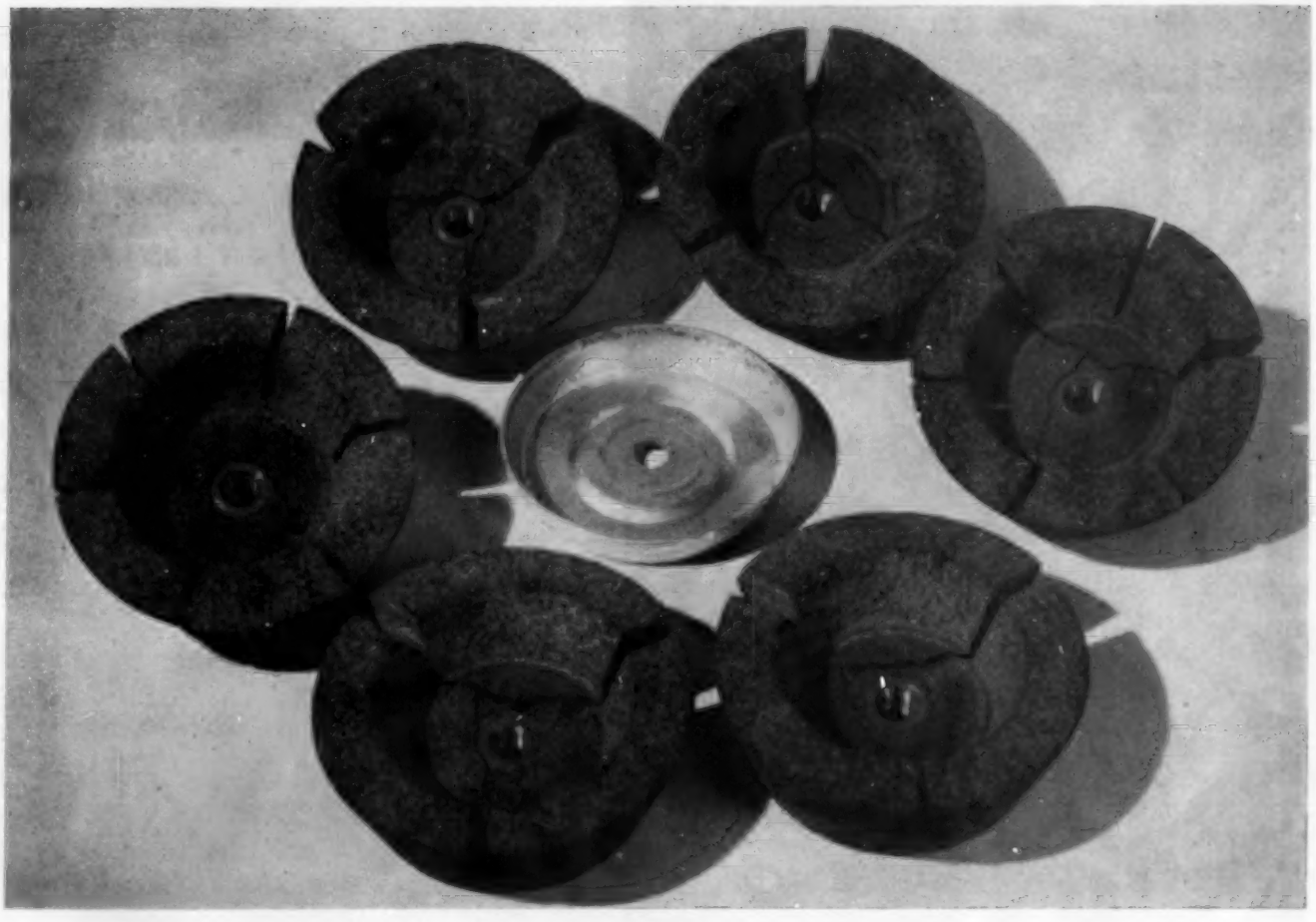


. . . . broken during test runs these wheels were held together by the wheel guard and

Big Step in Portable Grinding Safety . . . .

● TODAY the majority of grinding wheel manufacturers have developed new types of threaded wheel bushings, molded right into the back of cup wheel for driving it. The bushings present a solid steel back which serves as a permanent molded-in back support. This development has been a big safety step, since angled prongs, as part of the bushing cup-wheel unit, often holds a broken wheel until machine can be stopped.

But with all the precautions to insure safety for the grinding machine operator: perfect wheels, correct rpm speeds, periodic inspection, proper wheel mountings, etc., there is still one must: the Wheel Guard.

Morrison Products Inc., of Cleveland, Ohio, make about 90% of the wheel guards supplied on all portable grinders. The Morrison people, in collaboration with the Safety Committee of the Grinding Wheel Institute, developed a revolving cup guard, that while lighter in weight, gives the maximum safety to grinding wheel operators.

After the severest speed tests it was demonstrated that cup guards reinforce the wheels against breakage. Should wheels break, the guards hold the pieces until machine is stopped.

The tests have proven that these wheel guards, plus the anchor-type bushings, give positive protection to the operator. The cup guards are in one piece, giving much greater strength with less weight and do not interfere with the operator's vision.

Photo shows test made by Norton Company. The grinding wheels were purposely broken in speed test machines equipped with revolving cup guards.

The wheels, although broken, remained in the guard until they were removed after the machine had stopped. The danger of flying wheel pieces is thus eliminated.

With proper handling, inspection and servicing

remained in the guard until removed . . . .

"Maximum" Speeds

The maximum speed shown on blotters or tags supplied by wheel makers is the maximum speed at which the wheel should be run. It is not the recommended speed for best performance. Maximum speeds are based on the strength of the wheels with a reasonable factor of safety; it must not be assumed that this speed is best for all jobs and for all conditions. Always check the manufacturer for the recommended speed for a particular operation. You'll get more production. You'll observe good safety practice.

. . New Wheel Guard

of the grinder and guarding of the wheels breakages can be practically eliminated.

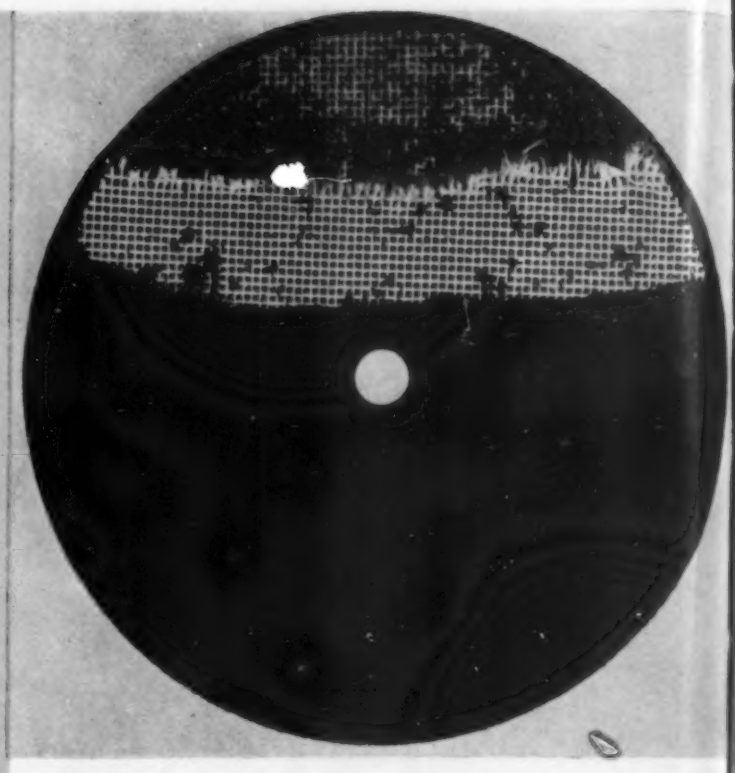
Wheel breakage on portable grinders is unnecessary . . . use common sense . . . obey instructions. . . .

Most common cause of wheel breakage is undoubtedly excessive speed. Check maximum operating speed of the wheel against machine speed; make correct allowances. Setting up regular speed checks on all kinds of portable grinders is a must! These speed checks should not only determine the actual rpm's of the machines as compared to their rated speeds, but should also make sure that the machine speed does not exceed the greatest operating speed of the grinding wheel.

The rated speed in comparison to the actual, in some cases, varies as much as 3000 rpm. When one realizes that breaking stress would be increased 2¼ times in this case, we see why many of the breakages occur.

In heavy-duty grinding work, where pneumatic portable grinders are used, the operator is faced with another possibility of serious wheel breakage. While the majority operators can tell by the sound of their grinders whether air pressure is constant, some cannot notice the warning signal in time to prevent damage. Naturally, excessive air pressure means over speeding, while less pressure means a slowing down. This slowing down of the grinding wheel causes it to act much softer, and go into a jolting action which may cause breakage. Check your air pressure.

Another cause for excessive wheel breakage is improper mounting. Sometimes, light-weight portable grinders, designed for reinforced disc-type wheels, are used with cup wheels on heavy grinding jobs. An inadequate back flange designed for light operations, fails to give proper support, often causing wheel breakage. The grinding wheel must be mounted correctly with a rigid support. ● ●



This glass reinforced cut-off wheel has three layers of abrasive mix and two layers of glass cloth. The granules of abrasive mix penetrate the openings in the cloth. This situation is similar to reinforcing concrete with an open mesh screen where the concrete layers set simultaneously above, below, and in the mesh. This feature overcomes the problem of stratification that is present when the mesh size is smaller than the granules in the mix. The sides of the wheel are knurled to provide a free cutting action.

By **P. L. Shanta,** Supervising Engineer,
Technical Services Branch, Research and
Development Div.
The Carborundum Company
Niagara Falls, N. Y.

What You Can Expect From

- ✓ **use these wheels for smoothing, removing welds**
- ✓ **they reduce operator fatigue**
- ✓ **ideal for portable equipment in foundry, steel mill**
- ✓ **use them for ferrous and non-ferrous materials**
- ✓ **in building industry use on stone, tile, masonite, cement blocks**

THE HIGH SPEEDS possible with fiber glass reinforced cut off wheels result in faster cutting action, increased safety, and—in the majority of cases, longer wheel life than with non-reinforced wheels.

Operating speeds up to 16,000 surface feet per minute are now common for these glass reinforced cut off wheels. Greater safety has been an important factor in their wide-spread acceptance. The fiber glass reinforcement gives a higher degree of safety by strengthening the wheels against failure due to centrifugal stresses, flexure and shock. While giving greater safety, the glass fibers abrade at the same rate as the abrasive material and in no manner detract from the wheel's abrasive performance.

The fiber glass cloth becomes an integral part of the molded abrasive wheel. Layers of abrasive and a ply, or plies, of open mesh glass cloth alternate to form a laminated product. The cloth is open mesh construction so that the abrasive particles in the mix penetrate the openings. In this manner,

Glass reinforced plastic panel being cut with a glass reinforced wheel. A characteristic of glass reinforced plastics is that they are relatively easy to machine. Because of this characteristic, most operations that can be performed with an abrasive tool can be performed more economically than by other cutting methods. Wheel loading is not a serious problem. The little material that does accumulate on the wheel can readily be removed with an air blast.

Glass Reinforced Abrasive Wheels

additional strength is obtained because the abrasive mix in the mesh cements the abrasive layers together. This bonding of layers adds to the strength provided by the fiber glass cloth.

Depressed center or "hat" wheels have a similar construction except that the glass cloth layer nearest the top or hub of the wheel has been specially treated to prevent the fragments of an accidentally broken wheel from flying apart.

Three important wheel properties are enhanced by incorporating fiber glass reinforcement. These properties are the bursting speed, impact and flexural strengths.

Bursting speeds are calculated from the revolving speeds that produce sufficient centrifugal force to cause the wheel to fly apart. This is done on speed testing machines that progressively increase the wheel speed until it bursts. Reinforcing can increase bursting speeds by 35 to 100 percent.

Impact strength, calculated on a foot pound per square inch basis to accommodate various wheel thicknesses may be increased over 300 percent. The flexural strength—that is, the ability to withstand side pressures, is 2 to 7 times greater than non-reinforced products.

The performance facts compiled on fiber glass reinforced cut off wheels add up to higher peripheral speeds, faster cutting action with greater safety.

Although reinforcement adds strength to the wheel, careless abuse should be avoided. Reinforcement only makes these wheels more break resistant.

Reinforced wheels have found their way into many operations where non-reinforced products

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EDITOR'S NOTE: This article, written by the Carborundum Company, describes some of the advantages and some of the applications of glass-reinforced abrasive wheels. The majority of wheel manufacturers list this type of wheel in their line under a special trade name and information is readily available. The trade name for Carborundum's glass reinforced wheel is CARBOFLEX.

The controlled rigidity that is engineered into glass reinforced wheels makes them ideally suited for cutting gates and risers. This cut off wheel is being used on a non-ferrous casting. The wheel rigidity prevents drifting in the long cuts. The knurled wheel sides keep the wheel from binding and produce a good finished surface.

were formerly used. In addition, these tough, safe, fast cutting wheels are finding new uses where former types of cut off wheels were not practical.

Glass reinforced wheels are used for concrete cutting to fill the gap between expensive diamond wheels used on large cutting jobs and small jobs that may be done by hand. Ideally suited for small and medium sized jobs, these wheels often are used by contractors who need good general purpose cut off wheels because their low initial cost, approximately 1/50 the cost of a diamond blade, reduces capital investment. A good example of their use is for burying oil burner feed lines in cement cellar floors.

The depressed center glass reinforced cut off wheels do a fine job on removing, or smoothing welds. Light, in comparison with other wheels, they reduce operator fatigue and at the same time provide a greater safety factor. Depressed center wheels are also used for beveling the sheet edges before welding. When joints are filled with a series of beads, the reinforced wheel is ideal for removing slag and cleaning the surface for proper adhesion between the beads.

The numerous hand operations associated with foundry practices have given way to semi-portable and portable grinding and cut off machines mounting reinforced wheels. The versatility of this type of wheel is the feature that lends itself to foundry use. The same depressed center wheel may be used for notching and cutting off risers and gates, removing burned sand and cleaning the casting. Satis-

PHYSICAL PROPERTIES OF CUT OFF WHEELS (APPROXIMATE)

Type Reinforcement	Bursting Speed in S.F.P.M.	Impact Strength Ft.lbs./in.^{2}	Flexural Strength psi.
1. Non-Reinforced	20-24,000	75	1,000
2. Glass—Semi-Rigid	27-30,000	300	5,000
3. Glass—Very Rigid	36-42,000	400	7,000

Cutting steel plate is only one of the many cut off operations in the fabrication of steel for which glass reinforced wheels are engineered. The reinforcing permits safer operation at the high speeds necessary for fast cutting. The extremely high flexural strength built into these wheels prevent fracturing when the wheel is inadvertently twisted in the cut. The knurling visible in the above photograph functions in the same manner as tool relief in machining to provide free cutting action.

Glass reinforced depressed center wheel smoothing a torch cut steel sheet. These wheels are used at an angle to keep the grinding action at the wheel edge. This eliminates excessive heat generation, and takes advantage of the peripheral speed to produce a better finish in less time. A specially treated glass cloth layer prevents fragmentation if the wheel is accidentally broken.

In foundry work, the versatility and rugged depressed center glass reinforced "CARBOFLEX" wheels increase production. Here a depressed center wheel is removing burned sand. Without changing wheels, the operator performs all of the rough grinding operations such as notching and removing risers that are necessary in the production of castings.

factory results are obtained on all ranges of ferrous and non-ferrous materials.

Reinforced wheels with their advantageous combination of cutting ability and safety are being accepted by steel makers and users. Applications in steel mills already include the use of depressed center wheels for smoothing edges and sharp corners of billets prior to rolling. Shipyards are using reinforced wheels for fitting plates, propeller repair, weld grinding, and cutting structural and reinforcing steel. Railroads repair rails and grind rivets and welds in new car construction with these wheels.

In the non-metallic field, reinforced cut off wheels have three outstanding features. These features are: their great strength, their high speed of cutting and their long life. The glass reinforced wheels are ideal for cutting fiber glass reinforced plastics.

The safety inherent in the glass reinforced wheels has caused them to displace standard cut off wheels used in cutting building and fire brick, stone, tile, cement blocks, transite, masonite, etc.

The fiber glass cloth provides wheels with higher initial strength so that a much greater force is required to cause fracture. Secondarily, in some wheels, the glass cloth is chemically treated to hold together the pieces of an accidentally broken wheel. The safety designed into these wheels permits high operating speeds which increase the cutting efficiency.

Even though higher strength and fragmentation resistance are engineered into the reinforced wheels, users should operate them with guards provided by the machine builder and under the wheel manufacturer's recommended instructions. ● ●

Economical Concentration of Diamond Compounds in Lapping Operations

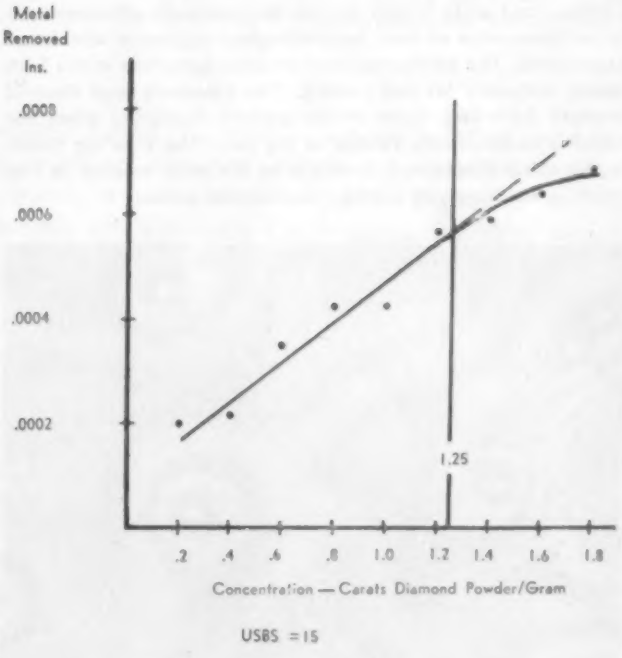
The question has been asked often: What is the most economical concentration of diamond compounds, or better, from what point on is an increase of diamond concentration not yielding a proportionate gain of work?

To answer this question the Union Wire Die Corp. has subjected all available commercial compounds including their own Unilap to extensive tests. The nine USBS grades most commonly used in finishing and lapping tungsten carbide were investigated. Each grade was made up in different diamond concentrations and the amount of stock removed per unit time accurately measured employing rigid controls. Concentration, of course, means pure, precisely graded diamond powder per gram of compound.

A series of curves similar to the one shown for USBS No. 15 were developed. In all cases a first direct proportionality of stock removed against increased concentration was observed. At a certain but definite point this direct proportion ceased, and any further increase in concentration did not yield an equivalent increase in stock removed. For USBS No. 15 the optimum concentration was found to be 1.25 carats of diamond per gram of compound.

To sum up the results: concentration below 1.25 carats diamond per gram resulted in inefficient use of labor and time, whereas concentration above this point was wasteful in usage of expensive diamond. Studies were carried on over a period of ten months.

Other USBS grades were found to have optimum concentrations as follows:

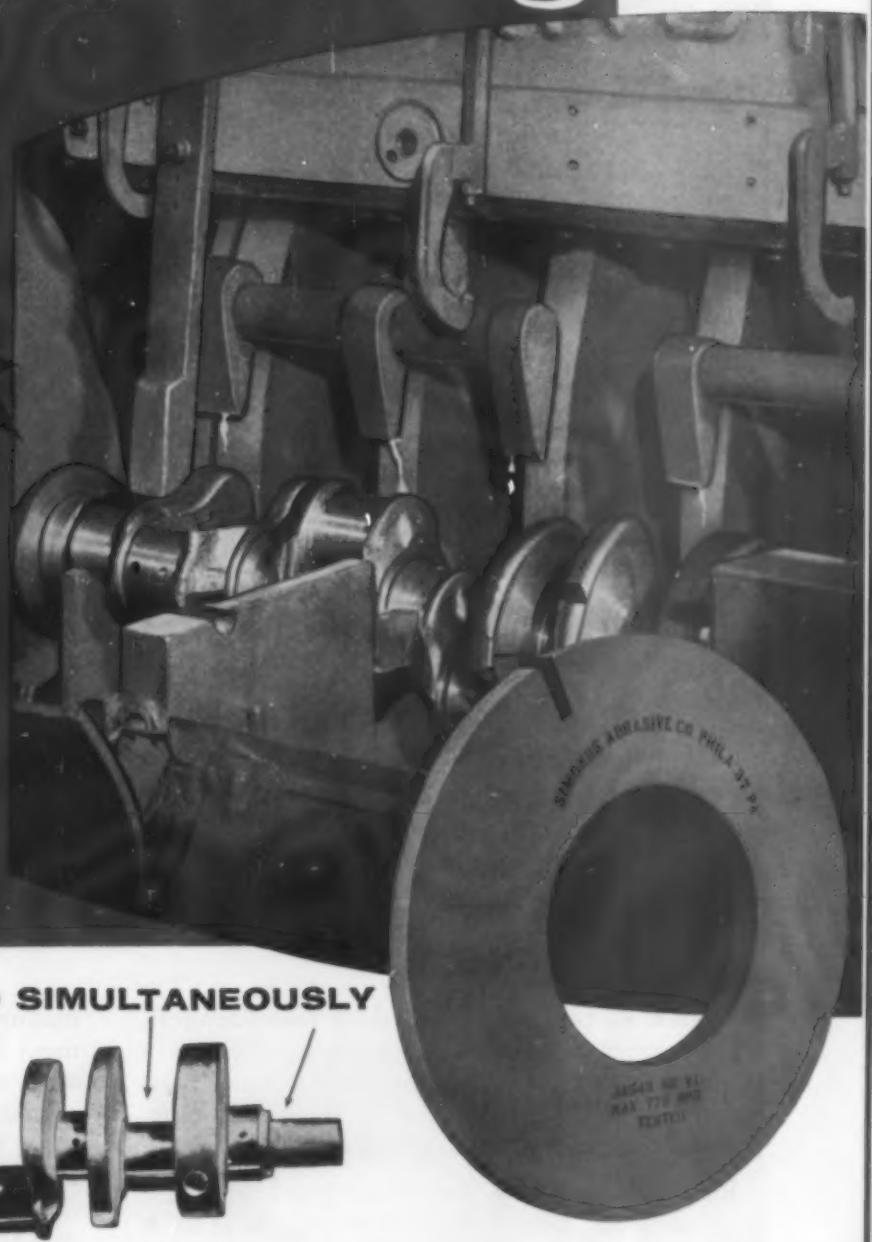


The research work was done by Union Wire Die Corp., 71 W. 45th St., N.Y., N.Y. ● ●

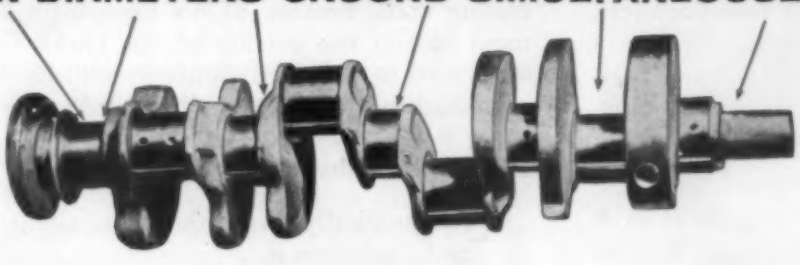
USBS Grade No.	Micron Size	(Carats Diamond/Gram) Optimum Concentration
1	0-2	.50
3	1-5	.90
6	4-8	1.15
8	6-10	1.20
15	8-20	1.25
30	20-40	1.75
45	30-60	1.75
230-325	60-80	1.50
170-230	80-120	1.50

For Multiple Grinding

specify SIMONDS ABRASIVE CO. grinding wheels in MATCHED SETS



SIX DIAMETERS GROUND SIMULTANEOUSLY



The crankshaft grinding operation illustrated here is typical of the production economies possible with "matched sets" of Simonds Grinding Wheels in multiple set-ups.

These wheels are furnished in counterbalanced sets, each wheel identified by set number, and painted on the face with a red stripe for accurate line-up on the spindle. Matched for best balance, these sets give more uniform grinding action, better and more production.

If you grind cylindrical parts requiring more than one diameter, investigate multiple wheel set-ups. A Simonds Abrasive Engineer will be glad to help you in determining the specification and recommended procedures for your job. Write for this service today.

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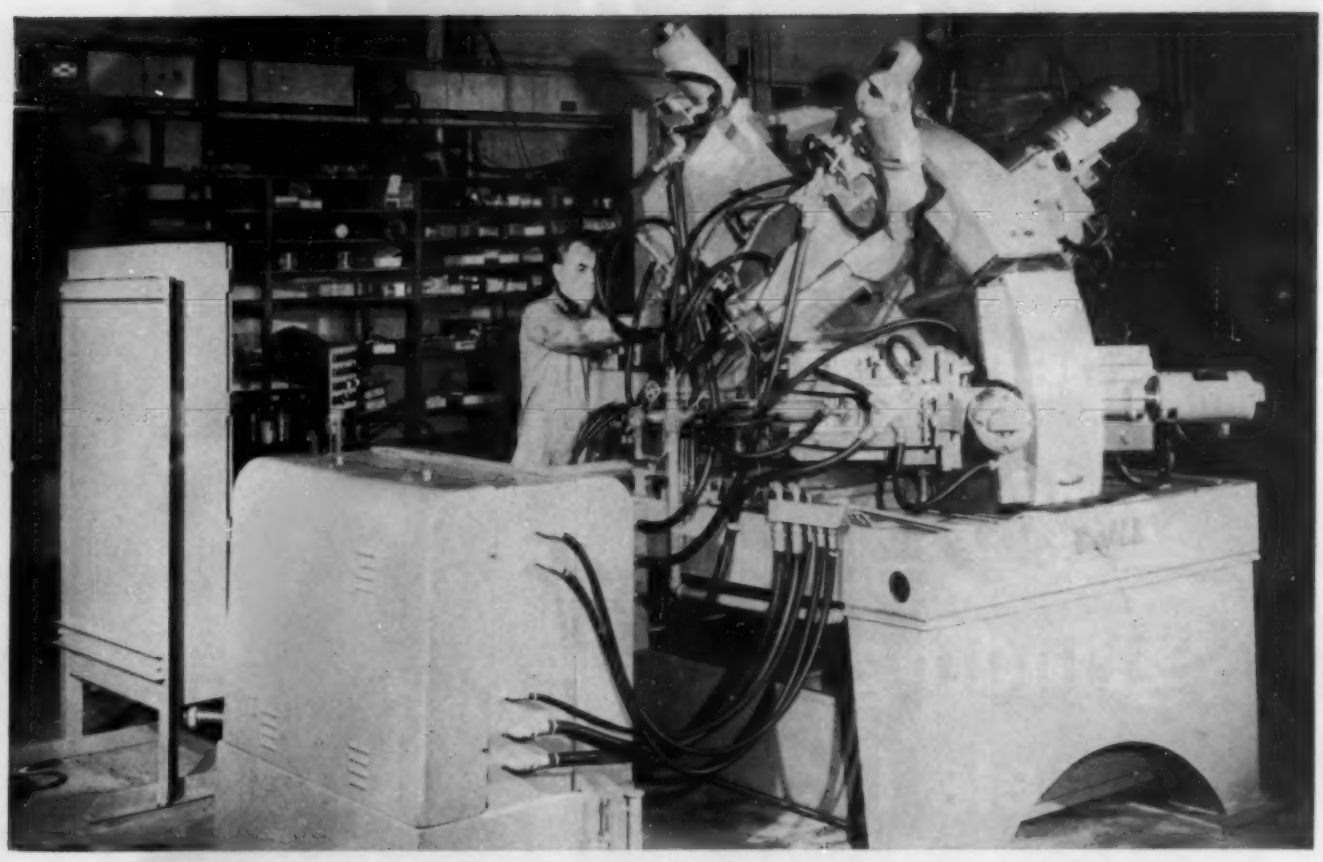


New products mean new machines, new techniques . . .

Automatic, Three-Stage Segment Grinder

● LIKE all progressive American manufacturers, Radio Corporation of America continually strives to price its products to attract the American mass market and like all manufacturers its prices depend on the efficiency of its manufacturing methods.

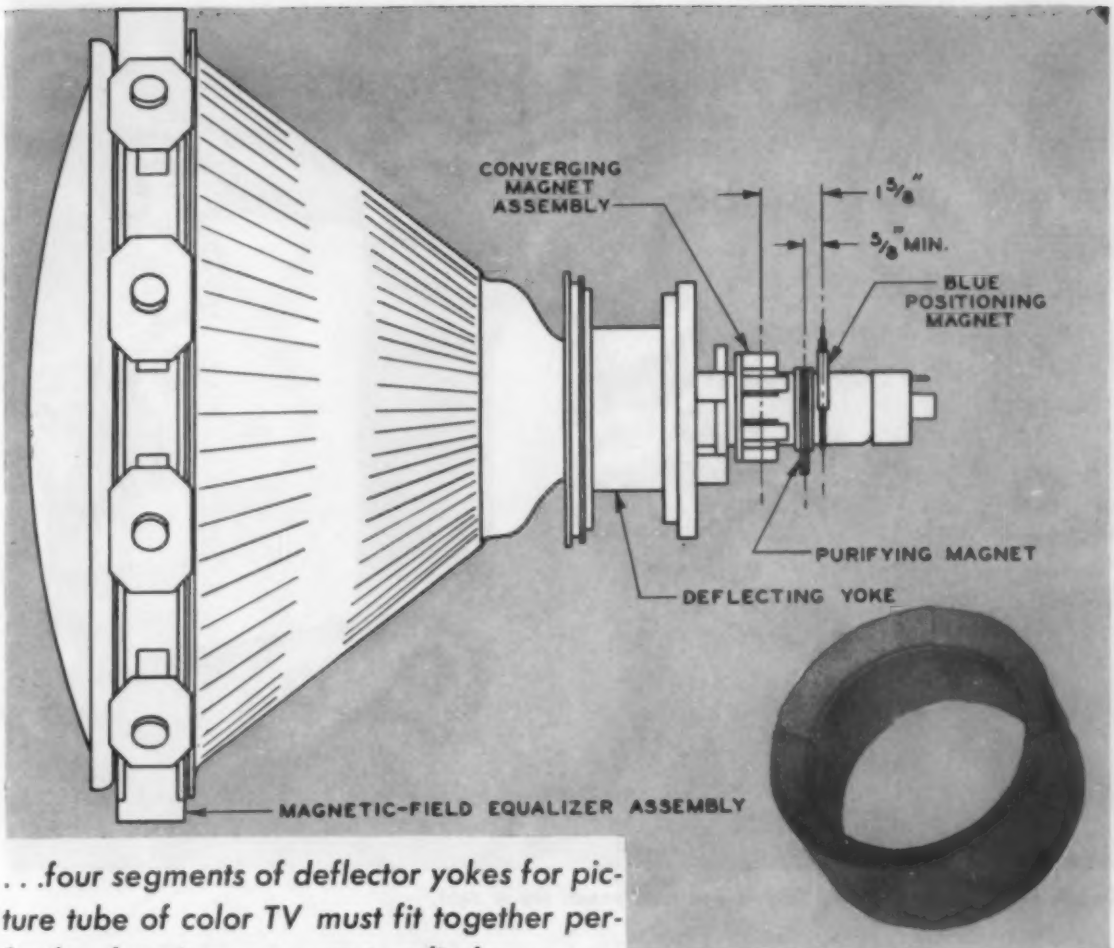
RCA frequently uses special machines to achieve such efficiency. One of the current projects at RCA is special deflecting yokes for use in RCA color receivers. A special machine tool provided the answer to a manufacturing problem.

The deflecting yoke is made up of four coils with a core molded in four segments to provide the desired electrical characteristics. These segments are molded from a special ferrite mix process similar to the powdered metal process. After molding, sintering takes place. The parts are fired at high temperatures and become hard enough to cut glass.

To get maximum efficiency from these cores it is necessary to form the eight mating surfaces between the four segments very accurately to produce an exact cylinder, a smooth surface and true 90° mating ends. Because RCA's Equipment Development Section was overloaded, the DoAll Company was called in, and in conjunction with RCA agreed on a machine design to handle the yoke segments.

Here's what the machine does . . .

1. Automatically loads the part, aligns, grinds, and discharges it.
2. Grinds both ends of the segment simultaneously.
3. Automatically takes the segment down to the desired dimension, finish, and flatness in three fast, successive grinds. (Finish 16 micro inches RMS; flatness within 20 millionths across entire surface, figure 1.)
4. Maintains the plans of the ground ends at 90° to each other within 50 micro inches over the ⅞" end width and does this while producing the pieces at a rate of one piece every three seconds, figure 1.



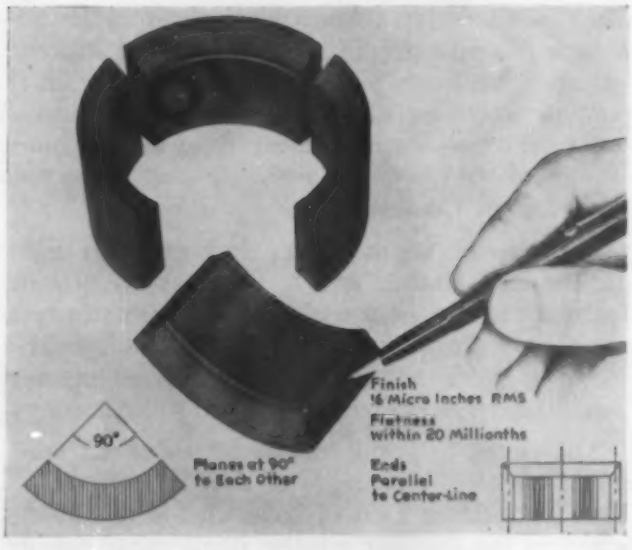
. . .four segments of deflector yokes for picture tube of color TV must fit together perfectly, forming an exact cylinder as . . .

Grinds 8 Mating Surfaces to 16 Micro

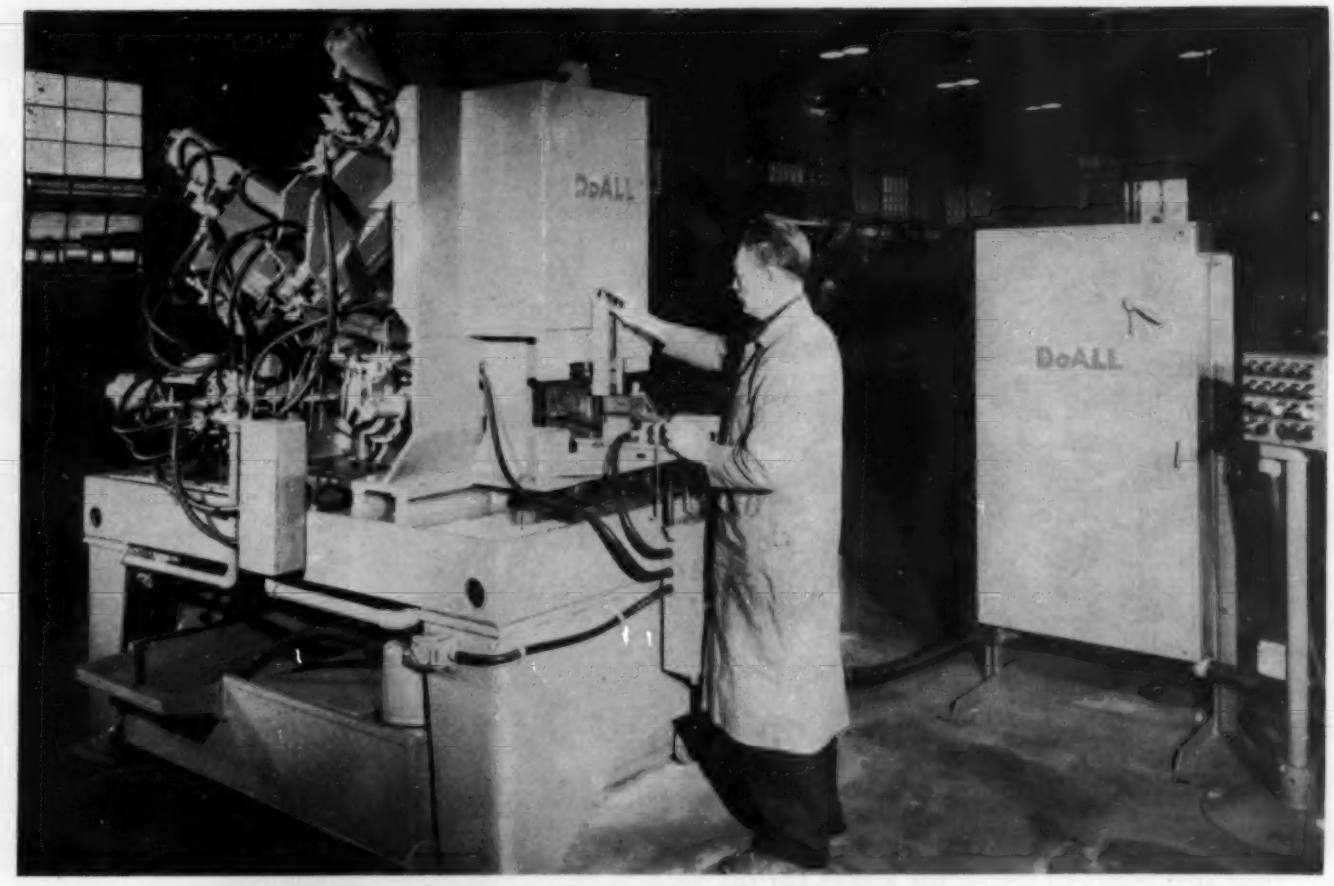
Here's How . . .

Segments, molded of powdered ferrite, are stacked in a vertical hopper, ends facing out from the machine, figures 2, 3, and 4. A hydraulic loader at the base of the hopper pushes the bottommost segment into a fixture, one of 36 mounted on the periphery of a large motorized wheel (48" diameter) called the "index wheel". Upon seating the segment, the loader also pushes a lever that causes the fixture to clamp the segment securely in place.

When a part has been loaded, the wheel indexes 10°, moving the loaded fixture toward the first pair of grinding spindles and the next empty fixture up to the loader. The work pieces are carried through three grinding stations. At each station, the index wheel stops and is accurately positioned by a hydraulic actuated locking pin. After the index wheel is securely locked, twin grinding spindles, moving hydraulically on hand-scraped ways, carry diamond, cup grinding wheels across the segment



1. The segment must be ground within the tolerances shown in the illustration. This is done even while producing pieces at the fantastic rate of 1 every 3 seconds.



Hopper side of the DoALL grinder built for RCA. Control and relay panels are at right.

faces. At the first station, all but .035-in. is removed; at the second, .025-in. more, and at the third station the final .010-in. of stock is removed to bring the piece to size and to generate an extremely smooth surface flat and square to 20 millionths.

After completing their pass, the grinding spindles withdraw to starting position, the index wheel rotates through 10°, the loader seats another segment in an empty fixture while the spindles advance again on a grinding pass toward the adjacent fixture. The work piece is carried past the final position where an automatic ejector drops it to a conveyor which carries it away from the machine.

Basic Design Considerations

To generate micro-finishes and maintain tight dimensional control, it was necessary to provide balanced, reinforced mass in the grinder's structure to achieve dampening, rigidity and stability. The index or work holding wheel is carried upon a 5-in. diameter steel shaft and tapered roller bearings.

The electro-hydraulic design which effects automatic downfeed accurate to .0002-in. in the standard DoAll grinder is used to index the work holding wheel in the segment grinder. Great mass, rigidity and positive locking of the index wheel before a grinding pass contribute to the remarkable finishes produced by this machine. The hydraulic index stroke is cushioned to provide rapid but shock-free deceleration of the heavy index wheel.

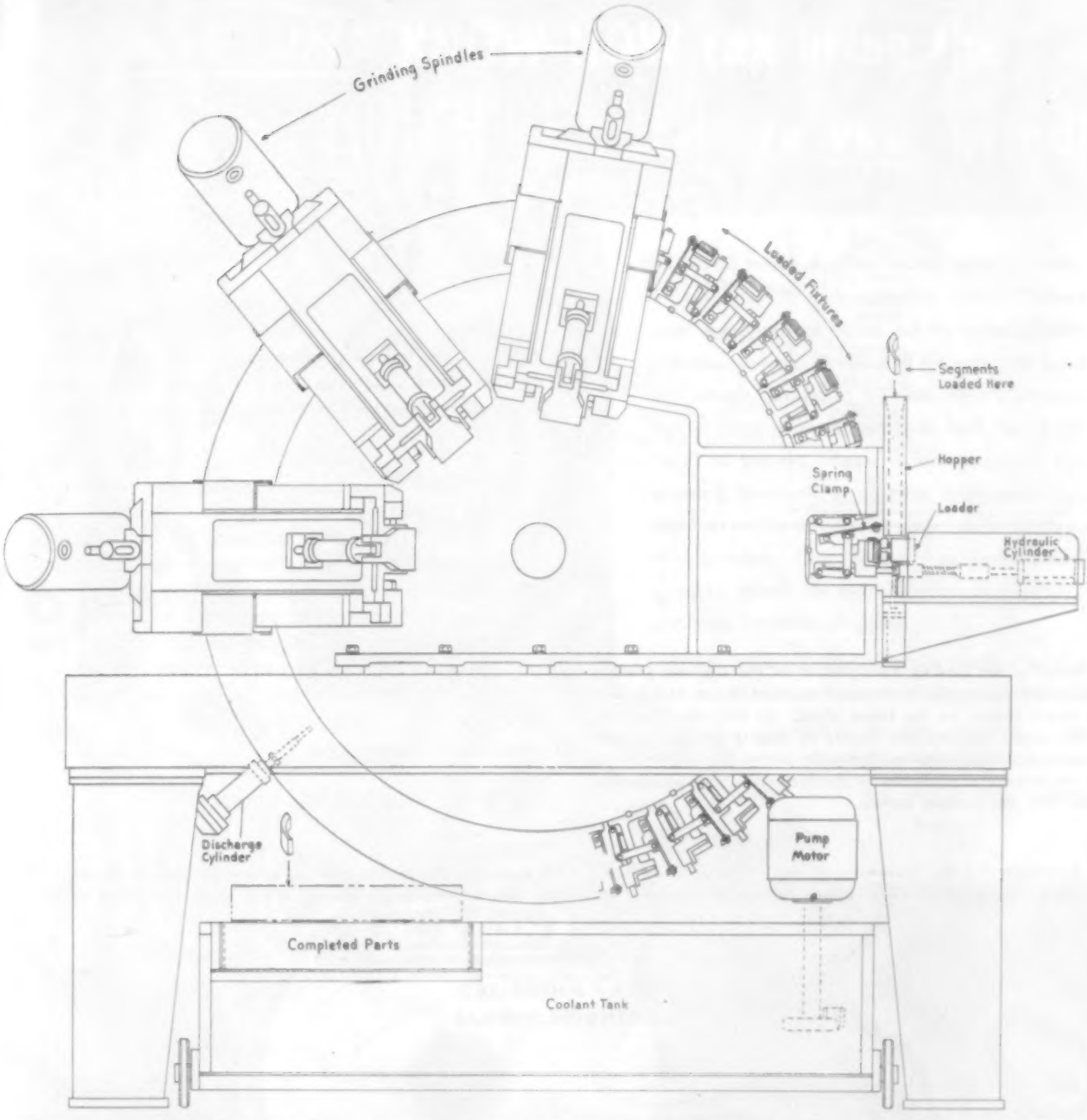
As in the case of DoAll's standard grinder, (5), long spindle columns, handscraped to fit heavy column ways, support the 1½ hp motorized cartridge type spindles. Both sliding and fixed members of the spindle actuating assembly as well as all other castings of the machine are made of special nickel-chrome cast iron, a material possessing stability and excellent wearing qualities.

Spindles

The motorized cartridge type spindles are standard DoAll types used in the company's 6-in. x 24-in. and 8½-in. x 24-in. surface grinders. An integral 1½ hp drive motor and tapered roller bearings give them considerably more power and load capacity than ordinary spindles of the same size and type. Tapered bearing construction provides the capacity to withstand the axial loads experienced in this type of grinding. The precision bearings are preloaded to maintain total indicator runout of less than .0002-in. at the spindle nose and a minimum temperature rise under continuous operation. Permanent lubricant and special oil seals preserve the bearings for the life of the spindle.

Automatic Lubrication

A metered automatic lubrication system for all sliding ways has been incorporated in this machine.

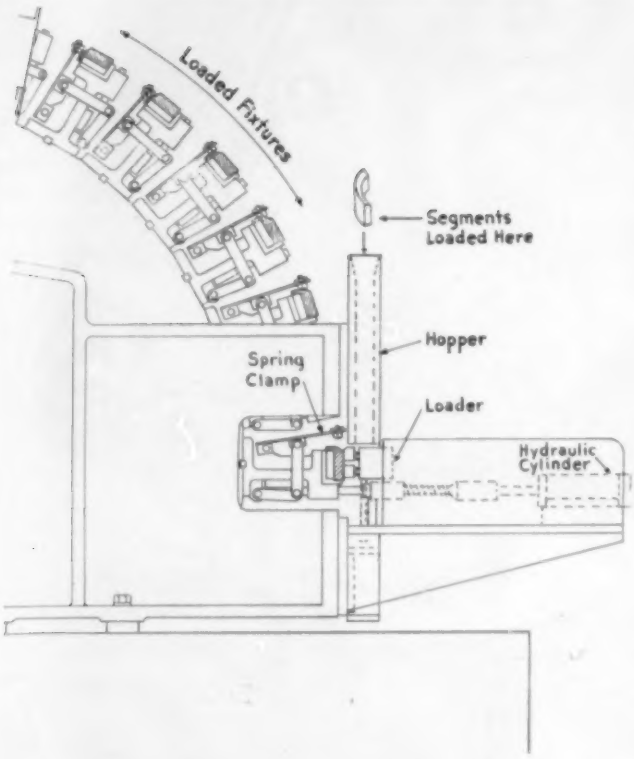


2. Schematic of the special segment grinder showing location of the loading and discharge stations and grinding spindles, with respect to the index wheel.

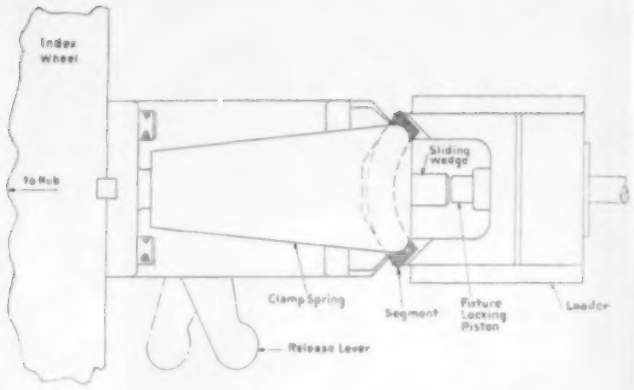
Work Holding Fixture

In designing the 36 work holding fixtures, several severe limitations were dealt with. The work piece of sintered powdered metal is extremely hard, brittle and rough. The pieces vary considerably due to distortion that takes place during the sintering operation. Since the actual grinding is performed by diamond wheels, the fixtures must withstand a bath of grit-laden coolant. With only 10° of arc on a 48-in. diameter for mounting space, the fixture must, nevertheless, be strong enough to support the work pieces under grinding loads. Their location on the periphery of a revolving wheel and the flood of grit-laden coolant makes either hydraulic or electrical actuation impractical.

The ultimate solution was a compact lever-actuated spring clamp shown in figure 3. Locating pads in the fixture are made of hardened tool steel and are designed for easy removal and replacement, making for inexpensive maintenance. Sufficient adjustment has been provided for, to permit compensation for possible variation between runs of the sintered parts. The part is held in place by a leaf spring



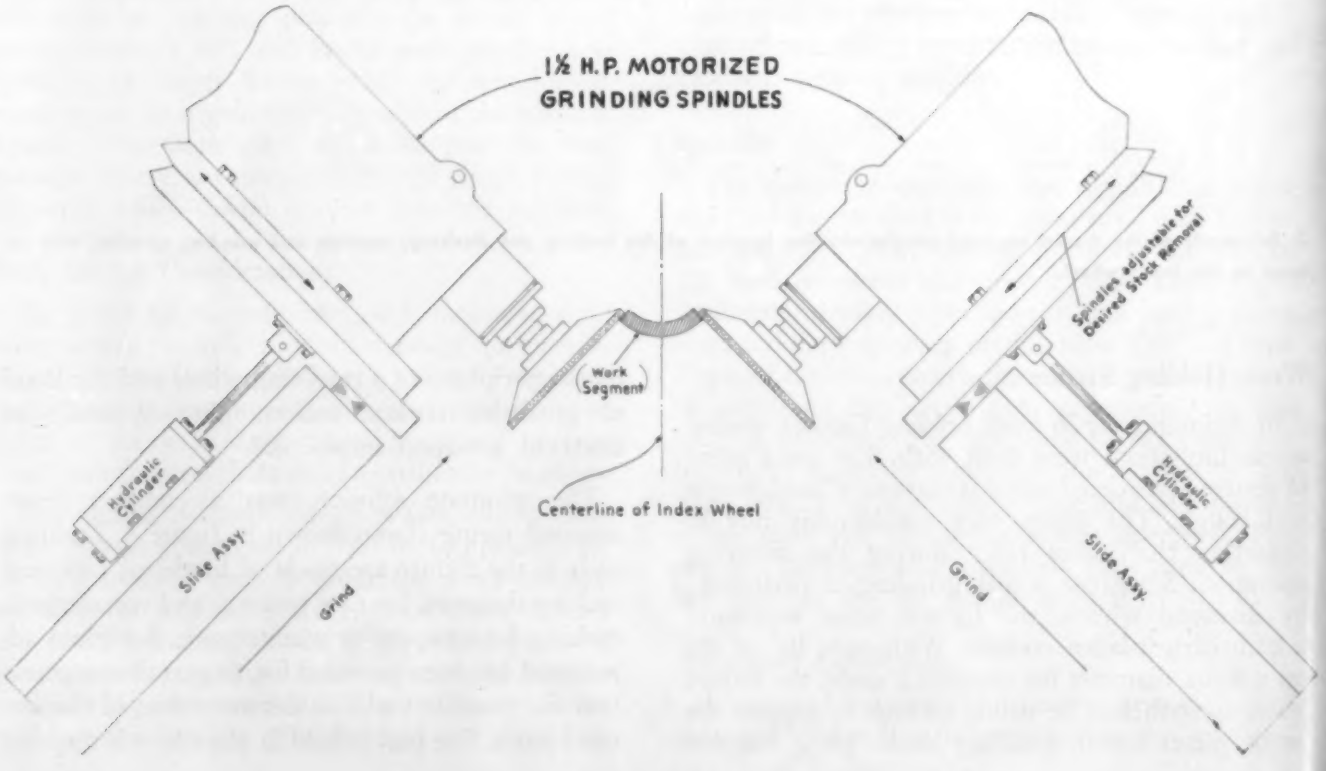
3. Detail of the loading arrangement on the segment grinder. The loader pushes the bottommost segment in the hopper into an empty fixture on the index wheel. At the same time the loader piston actuates the fixture so that it clamps the part securely in place. Another hydraulic piston (not shown) holds up the column of segments in the hopper to prevent interference with the loading action.



4. Top view of the fixture showing the position of the loaded segment. Lever protruding below is tripped by a hydraulic piston at the end of cycle to release a finished part, see figure 2.

to which are attached hardened fingers which contact the tapered lip of the segment. A simple link arm and wedge system, actuated by the hydraulic loader, locks the spring mounted fingers against the piece. A second arm is actuated by the hydraulic discharge mechanism to push the locking wedge back, permitting the fingers to release their hold and drop the finished part upon a conveyor running through the hydraulic tank at the bottom of the machine. The mechanical principles used are such that considerable wear can take place on all but the locating surfaces of the fixture without impairing its accuracy and efficiency.

5. Demonstrating the movement of the paired grinding heads with respect to the loaded segment on the distributing wheel. Note movement of grinding wheel across surface of segment. Hydraulic cylinders move the heads on the grind and return strokes.



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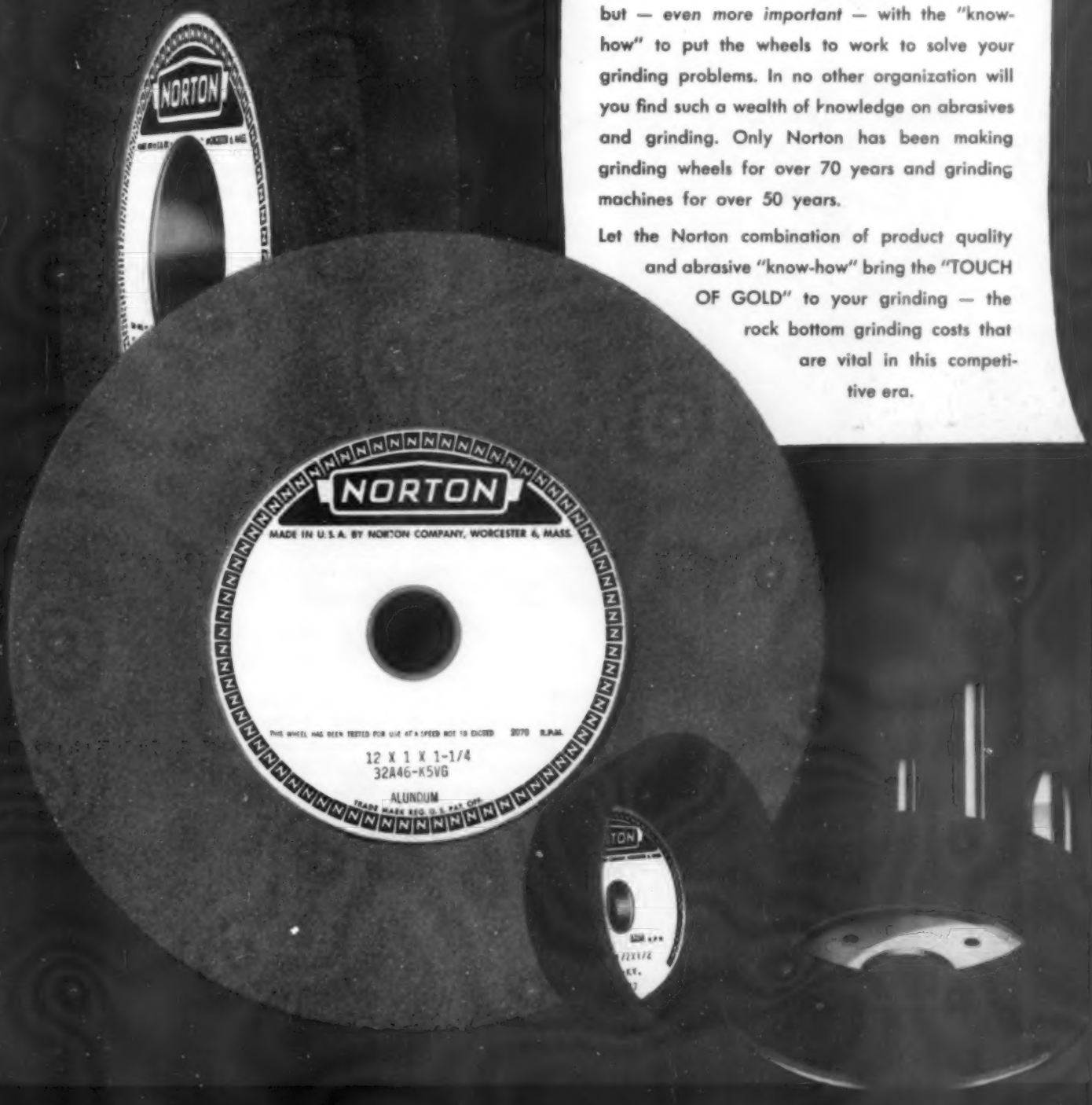

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Index Wheel

The index wheel and associated mechanism are of straightforward design but the tolerances held and the refinements of indexing and locking assemblies deserve comment. Fixture mounting pads are machined to an accuracy of +.0015-in., —.000-in. across the diameter. The 36 hardened steel bushings that provide a seat and the important locking locating pin are located with less than .002-in. variation between centers.

The wheel is indexed by a straightforward, hydraulically actuated rack and pinion operating through a cone clutch which is also engaged hydraulically for the indexing stroke and disengaged to permit the rack to return. Throw of the rack is adjustable for precise increments of rotation and its stroke is cushioned to provide smooth deceleration of the wheel prior to engagement of the locking pin.

As an indexing movement ceases, the locking locating pin moves under hydraulic action to engage the adjacent bushing in the index wheel. At the same time, another cylinder applies pressure against the opposite side of the wheel to support the wheel and thereby prevent any deflection that might be caused by the pressure of the locking pin against the wheel. The short taper of the pin and bushing makes these members self-centering.

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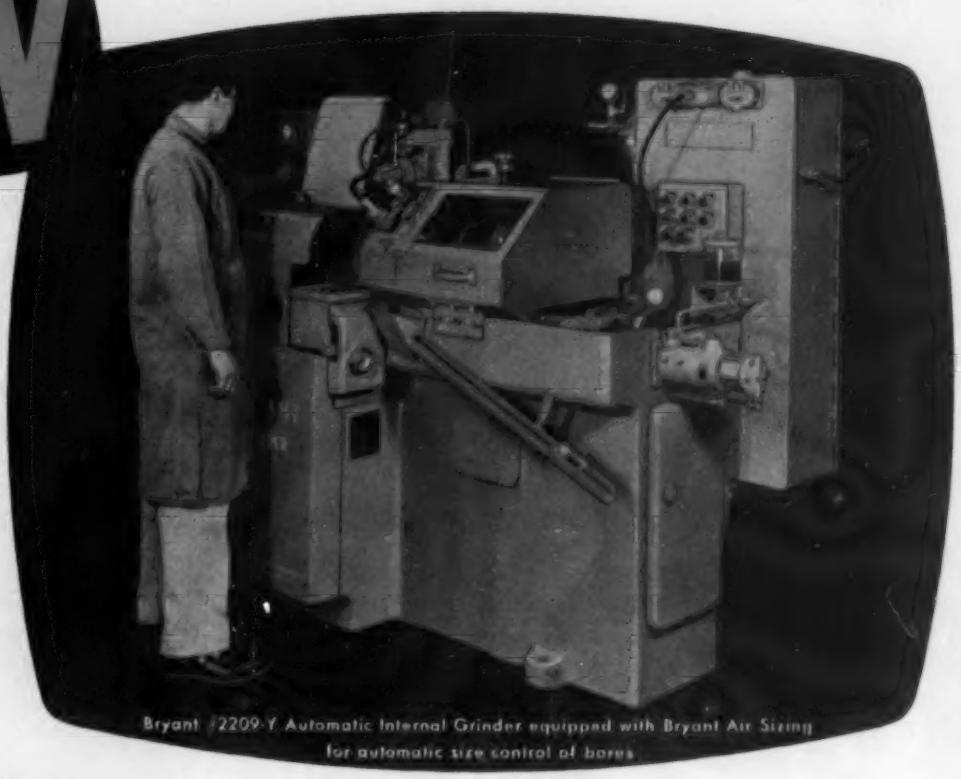
NEW

BRYANT air sizing . . .



Bryant 2209-Y Automatic Internal Grinder equipped with Bryant Air Sizing for automatic size control of bores

holds closer tolerances in internal grinding than any other sizing method!

This new method of sizing is designed especially for automatic production. It's extremely accurate, time-saving and economical—ideal for straight hole grinding when high-speed production, close tolerances and fine finishes are desired.

Bryant Air Sizing utilizes three principal operating components: Air Gage Panel, Bryant Impulse Timer and the Air Plug.

The Air Plug is mounted through the workhead and traverses continuously into the workpiece during the finish grinding cycle. Oscillation is timed and controlled from the wheelslide.

The Air Gage Panel measures the pressure peaks which occur at the air plug orifices each time the Air Plug enters the workpiece. These pressure peaks are multiplied to make gaging faster and more sensitive, and are then converted from pressure values into electrical impulses which operate the Bryant Impulse Timer.

The Timer continues the grinding cycle until the impulse signals stop, indicating that size has been reached. It then stops the grinding cycle and initiates the automatic loading cycle.

Bryant Air Sizing controls the size of workpieces *during the finish grinding cycle*. There is no contact between the gaging element and the workpiece. As a result, wear of the gaging element and possible scoring of the workpiece is eliminated.

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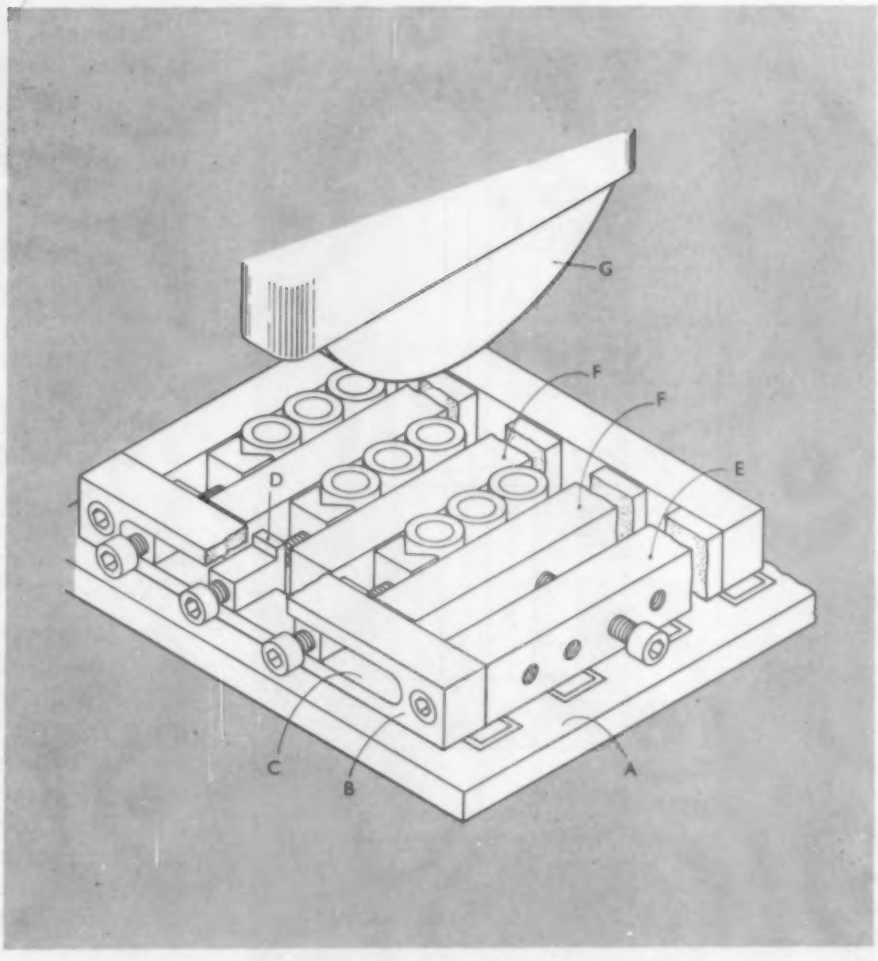
1. Small cylindrical components, ferrous, or non-ferrous, can be easily ground on the surface grinder by constructing a simple fixture. By use of magnetically permeable mild steel spacers between the rows of parts a good hold is obtained on the fixture by the chuck.



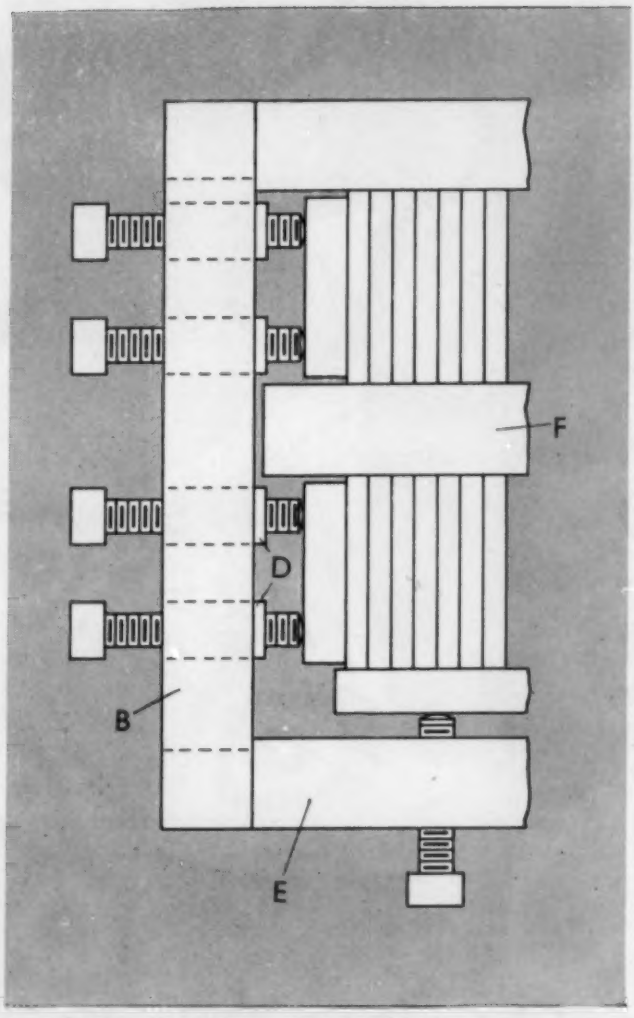
Universal Surface Grinding Fixture for Grinding Small Components

By **Tom Brown,** Consulting Engineer

● A USEFUL feature of the surface grinder is the way in which numerous small components can be loaded on the machine table and all ground off to a common height to a high standard of accuracy. However, when components become small in area on the ends it becomes difficult to persuade the average magnetic chuck to obtain a firm grip; there are gaps between the magnetic poles and the low flux density is insufficient to penetrate the work pieces. Another difficulty of magnetic chucks on surface grinders is their inability to hold non-ferrous materials such as aluminum, copper, brass and the like.

Small cylindrical objects such as pins are often required in large quantities and all are required to be of identical length, in many cases. If a pin is stood on one end, it is inherently unstable and requires some auxiliary means to hold it upright; in the surface grinder this would have to be some form of fixture.

The author was thinking about these problems of grinding the lengths of numerous small components both in ferrous and non-ferrous materials when he paid a chance visit to a printing plant. In the composing room it was observed that thousands of small bits of type were assembled together in a strong metal frame, open at top and bottom together with spacing strips and blocks of wood. When all these pieces were locked firmly in the frame by means of horizontally operating clamps, it was possible to carry the whole assembly from composing surface to machine, without everything falling apart. It was felt that something on similar lines to the methods used by printers could be adapted to the problems of surface grinding numerous small components.



2. Flexibility of the fixture in holding various types of small work pieces in large quantities is shown in figure 2 where short pieces of flat steel strip are loaded for surface grinding to width.

The resulting grinding fixture, based on the principle of the printer's "form" or "chase," is illustrated in figure 1 and is of very simple construction. The fixture comprises a strong steel frame of rectangular shape and of a size which will almost cover the top surface of the magnetic chuck **A** on the surface grinder. The inner vertical surfaces of the frame should be made to reasonable standards of flatness and squareness with the surface of the magnetic chuck.

In the end piece **B** of the fixture is machined a longitudinal slot **C** in which can fit a series of square-section nuts which have vertically projecting lugs **D** at top and bottom for engagement with the inner face of the end piece; the lugs prevent the nuts from pushing back in the elongated slot. It will be apparent, from figure 1 that the nuts can slide along the slot and can be set in any desired pitch or spacing.

A second series of clamping screws are provided along the side member **E** of the fixture. Holes are tapped in the member at intervals of about 1 in. so that any necessary number of clamping screws may be fitted.

In figure 1, a series of bushings are being ground to length. The bushings are loaded into the fixture in longitudinal strings with mild steel spacing strips **F** separating each string. The first row of bushings will be those in contact with the rear member of the frame which is gradually filled up with parts and spacing strips. The left hand side clamping nuts can be moved in the longitudinal slot so that the clamping screw axes intersect the center line of the row of parts.

It will be evident that the bushing shaped components may be ferrous or non-ferrous metal. The holding of the bushings in the frame is purely mechanical while the hold between frame and chuck is magnetic.

By the use of the magnetically permeable mild steel spacers between the rows of parts, a good hold is obtained by the chuck on the fixture.

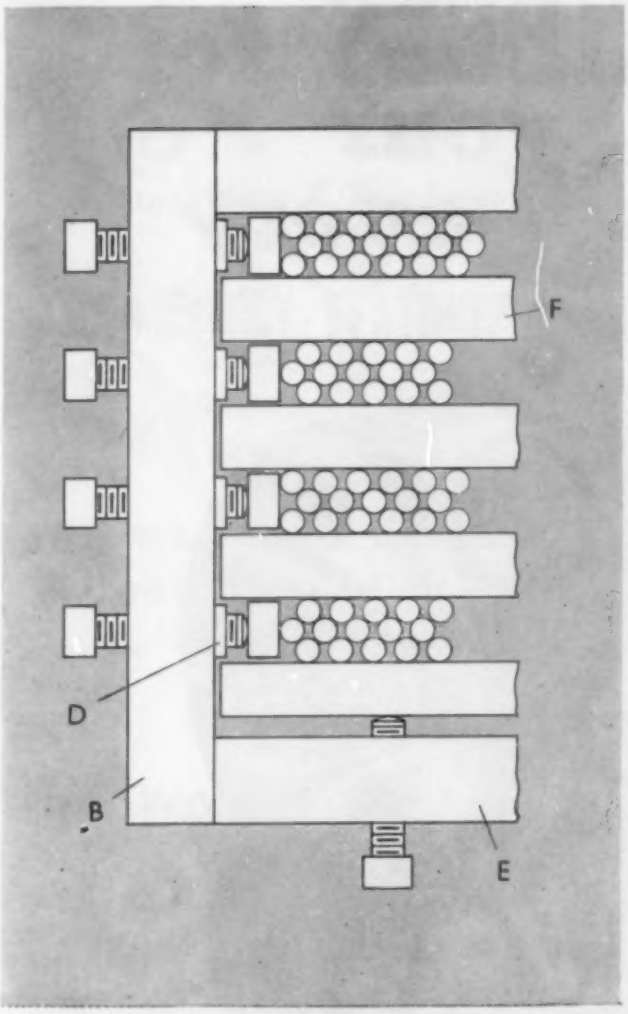
In the set-up illustrated in figure 1, the top surfaces of the bushings project above the general level of the fixture top surface and only one end is to be ground by the wheel **G.** It is, however, possible to grind both ends of a component by adopting the following procedure (these remarks apply to materials which are magnetically permeable): the fixture is raised clear of the magnetic chuck surface by inserting lengths of ground steel strip between them. The components are loaded and are held, together with the frame by the magnetic chuck. When the first side has been ground, fixture and components can be lifted off the chuck and reversed so that the ground surface is in contact with the chuck and the second slide is uppermost for grinding.

This ability to move the loaded fixture while the components are clamped in it allows two fixtures to be used; one is loaded by the operator who has a surface plate adjacent to the grinding machine. The other fixture is on the machine which is grinding the work.

There is another way of grinding both ends of a load of non-ferrous work. After the first surface of the components has been ground, the magnetic chuck is switched off and the fixture, complete with load is turned over so that the first surface is in contact with the chuck surface. The clamp screws are then eased off so that the fixture frame and its spacing strips slides downward into contact with the chuck face. The second surface of the component load will then project above the fixture and can be ground when the clamp screws have been retightened.

The flexibility of the fixture in holding various types of small workpieces in large quantities is shown in figure 2 where short pieces of flat steel strip are loaded for surface grinding to width.

The narrowest distance between any pair of spac-



3. Batches of 5/16-in. dia. pins are being ground on the ends.

ing strips is governed by the width of the sliding nuts which, in the example described, is ⅜-in. This need not rule out the possibility of grinding pieces of small section which can be persuaded to nest together. In figure 3, for instance, batches of 5/16-in. diameter pins are being ground on the ends and the way in which they are loaded in the fixture is fairly self-evident.

Another batch of nesting parts are shown loaded for grinding in figure 4. These comprise short lengths of extruded aluminum L-section material which required grinding accurately on both ends. Actually, before the fixture was devised, the ends of these L-section pieces were finished by hand-filing during assembly since the surface finish was important from the viewpoint of appearance only. The fixture enabled them to be ground economically to a very fine finish which had a better appearance than was obtained from hand-filing methods. ● ●

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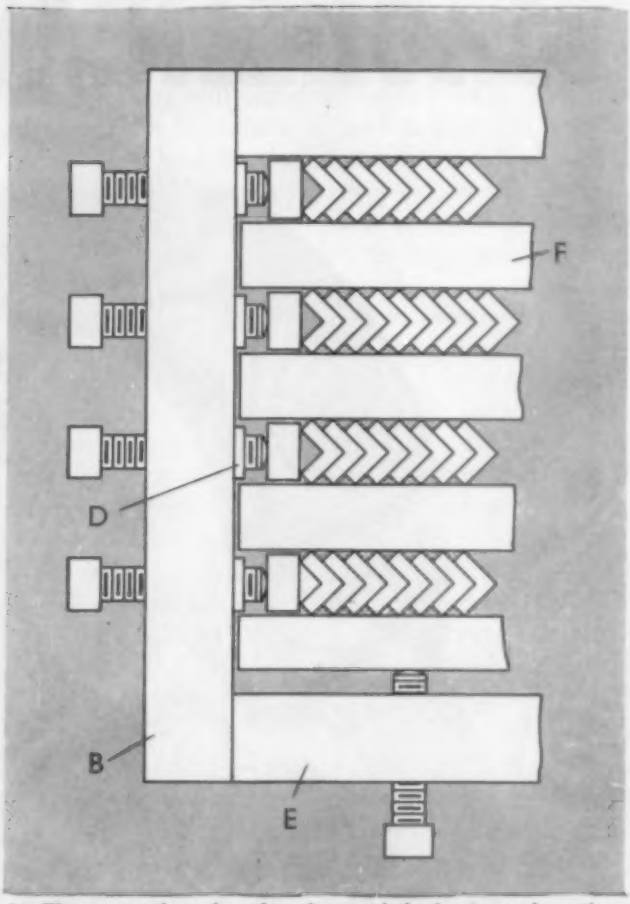

4. These are short lengths of extruded aluminum L-sections which required grinding accurately on both ends.

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A grinding & finishing SAFETY FEATURE

Men Who Make Accidents Happen . . . and How to Handle Them

The Worry Wart

By **Edmund Mottershead,** President
Mottershead Associates
Chicago, Ill.

THE MAJORITY of us go through periods of personal distress and uncertainty at one time or another. We wonder how we are going to pay our bills, if the new baby will arrive on time, if a friend or relative will die or recover, if we are going to lose our job, and a host of similar problems which we all face. But we usually manage to work ourselves out of a gloomy mood and develop a positive attitude towards the problem by trying to do something about it.

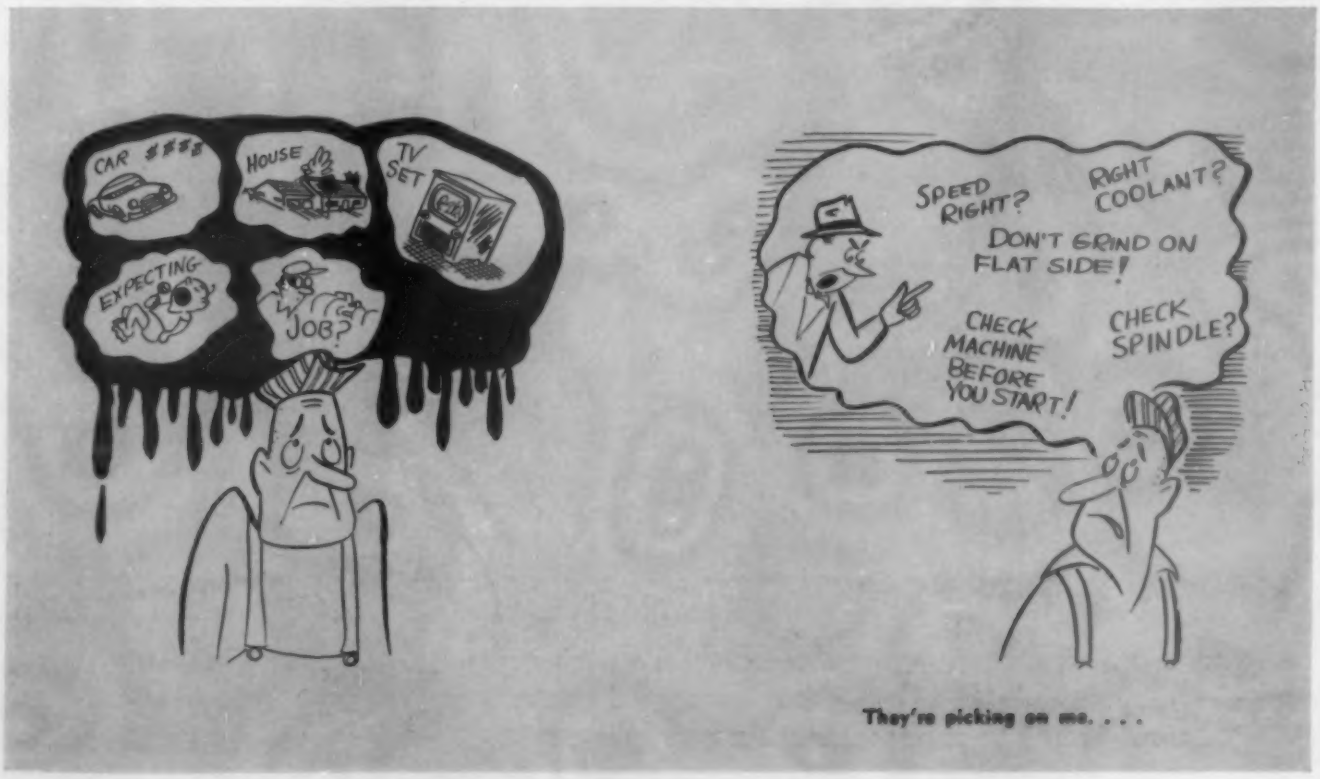
Some people, however, seem to reverse the process and enjoy brief periods of optimism once in a while, but quickly work themselves back into a perpetual worried state.

One such worry-wart was young Dan who had just been transferred into the grinding department. Dan's constant worrying was not an act designed to get sympathy; he really thought he had grounds for worry.

He was making payments on a car and a TV set and a house; he felt his taxes were too high; insurance cost too much; his third child was on the way; his kid brother had just been drafted; the new job looked as though it might be too much for him so he was afraid he might lose it.

"I don't know what to do next," he would say to his buddy, Henry, who worked in another department. "I thought getting a new job and a pay increase would fix things up for a while, but what a mess. I still don't know how we're going to pay off our bills. And then this job. . . .

"The foreman is always yakking about safety, safety, safety. 'Be sure to run the wheel at the right speeds. Run it too fast and it might fly apart. Don't



They're picking on me. . . .

grind on the flat side, only on the edge. Use a back plate wheel or a cylinder for side grinding. Be sure to use the right coolant. Check the machine every day when you start and give it a run-in for a minute or so. Stand away from the front of it when you start it up. Check the oil. Check the spindle for overheating.' And so on and on. I don't see how I'll ever get any work done in there checking all that stuff. And besides, I never see any of these things happen anyway. Nothing ever seems to go wrong with the grinders the other boys operate. But that guy has me worrying all the time. I can't believe the manufacturers would be so stupid as to make a machine that will blow up in your face anyway."

Mike had known Dan for years, had gone through highschool with him and knew him as a typical carefree youth, and thought at first that this continual worrying was a bit childish and that Dan would soon grow up and grow out of it. Mike liked Dan and hated to see him work himself into a corner and get into real difficulty just because of an unnecessary attitude.

One day Mike got fed up with Dan's anguished attitude and decided to try to do something for his friend before he lost his job. He had concluded that Dan did have problems, to be sure, but that Dan's lack of maturity made him blow them all out of proportion. Dan was even beginning to curse his "bad luck" and refuse to acknowledge that anyone ever had problems besides himself.

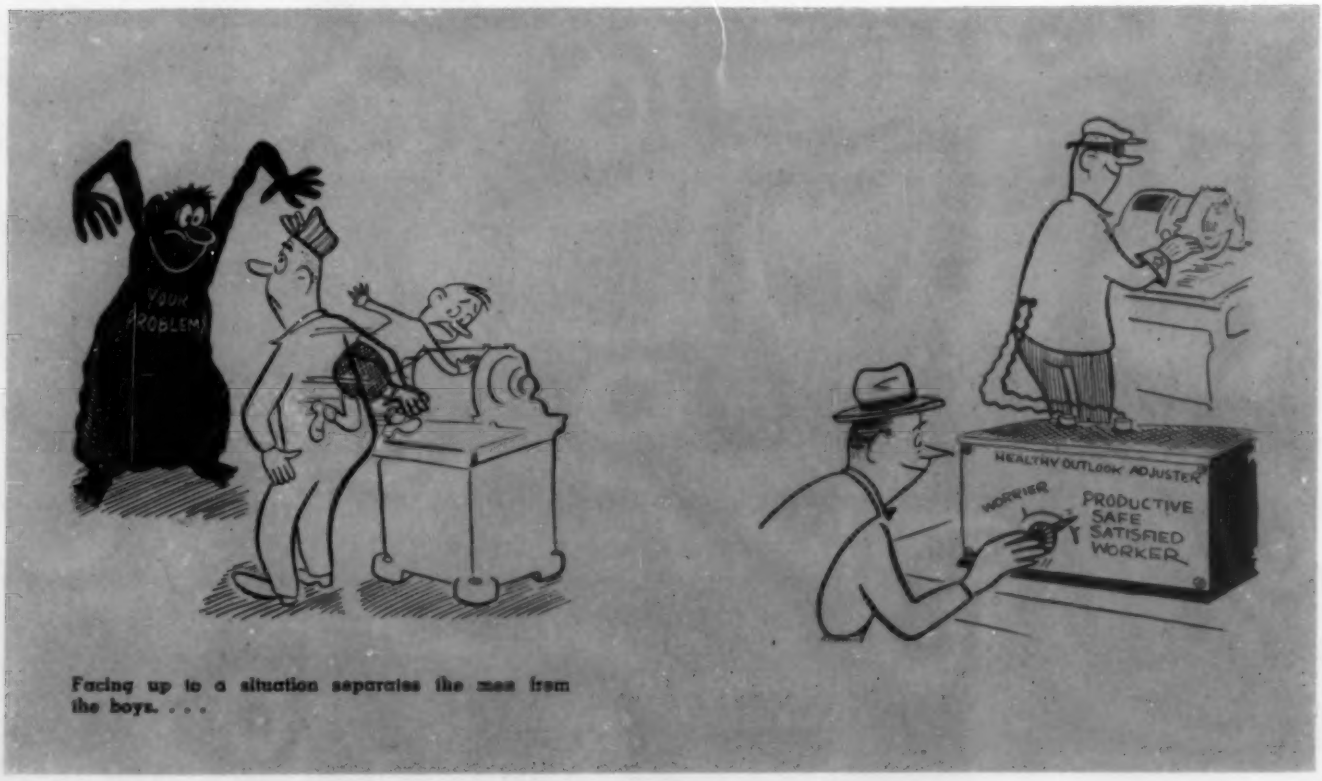
Mike began by suggesting, while riding home one night, that although raising a family provided a good many headaches it also brought real satisfaction to a man in the long run; that although taxes were high it was wonderful to live in a country in which we could have our say and be free to do something about unsatisfactory conditions. Mike mentioned that although bills were piling high we were still lucky to own a car and be able to use a TV set. Most important, he pointed out that though life was very uncertain for everyone, the men were always separated from the boys when the time came to face up to a situation.

Mike appealed to Dan's sense of personal pride. He unobtrusively gave him the choice of agreeing with him or admitting that he was a cry baby. Worry-warts like Dan never admit they are not big enough to handle their problems. They tend to blame everything on "bad luck" . . . "I always get the tough breaks" . . . the state of the world, or the animosity of other people. If you can make them admit, to themselves as well as to you, that life is pretty much what you make it, you have their problem mostly beaten.

Mike succeeded in developing a more healthy outlook in his friend, Dan, but Dan was never actually conscious of the process. From his point of view, he was working the whole thing out for himself.

Most foremen are acutely aware of the difficulties that workers' problems and personal attitudes can create. They are particularly aware of the unsafe conditions and eventual accidents, costly in life, limb and property, which can develop from such simple things as a guy who worries about himself and his job to the point where he falls down on the job itself.

Grinding and finishing foremen are particularly



Facing up to a situation separates the men from the boys. . . .

aware of the need for rigid compliance with the safe practices established by the manufacturers of grinding equipment and laid out by the plant safety engineers. Not all of them can depend upon some friend of the problem worker to straighten him out, and it is wise policy to be intelligently aware of the man who worries too much. A worrier like Dan, if left to himself, can do a lot of harm to the work, to his fellow workers, and to the whole department. Make your pessimists a little ashamed of their attitudes, aware of themselves as others see them, and anxious to demonstrate that they are really men, not children. The results will be greater productivity, a better safety record, and a solid feeling of personal satisfaction for you for having salvaged another man on the job. ● ●

Proper Storage of Coated Abrasives

● The right combination of controlled temperature and humidity keeps coated abrasives at their optimum grinding and finishing efficiency, and assures ease of handling and use.

Climatic conditions may have an effect on any coated abrasive at some time or other, whether the user is located in what is normally a "dry" climate or one which is generally thought to be "damp."

● CONTINUOUS studies reported by Minnesota Mining and Manufacturing Co., St. Paul, Minn., indicate that ideal storage conditions include:

1. A constant storage temperature of between 65 and 75 degrees F.
2. A controlled relative humidity of between 35% and 50%.

Generally speaking, coated abrasive grinding and finishing efficiency increases as humidity decreases. However, when a coated abrasive product is allowed to dry out too much, brittleness, cupping and difficulties in handling nullify the advantages of increased cut. At between 35% and 50% relative humidity, coated abrasives offer the ideal combination of cutting efficiency and ease of handling.

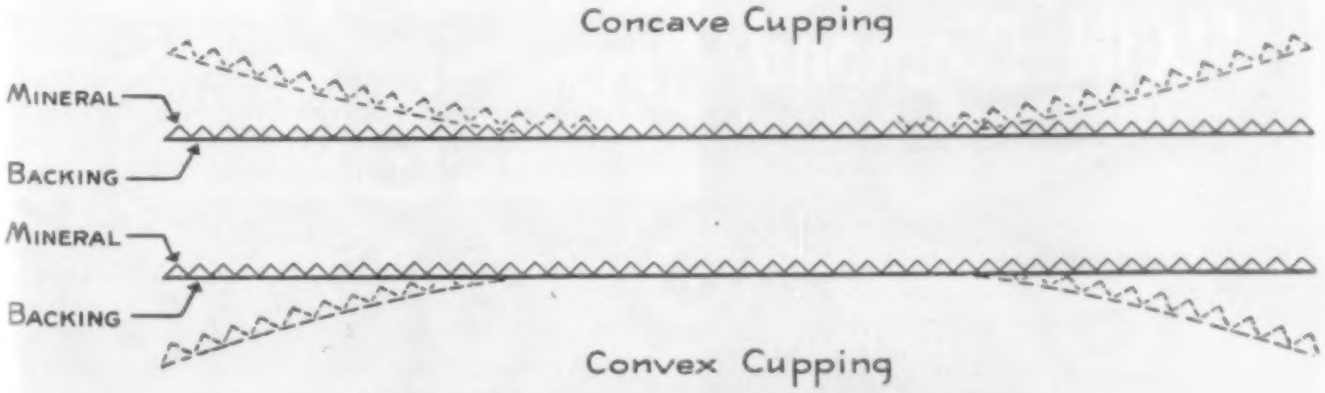
Poor storage conditions may effect coated abrasives in one or more ways. Excessive humidity, for example, may cause a softening of the bond (particularly in the case of glue bonds) so that when the mineral grains are presented to the work they tend to push into the backing or lay over on their sides instead of penetrating the work stock.

Excessive dryness, on the other hand, causes brittleness which creates difficulties in handling, possible mineral loss due to the brittleness of the bond, or convex cupping (that is, with the mineral side out) due to shrinkage of the backing as it dries out.

These storage recommendations are suggested:

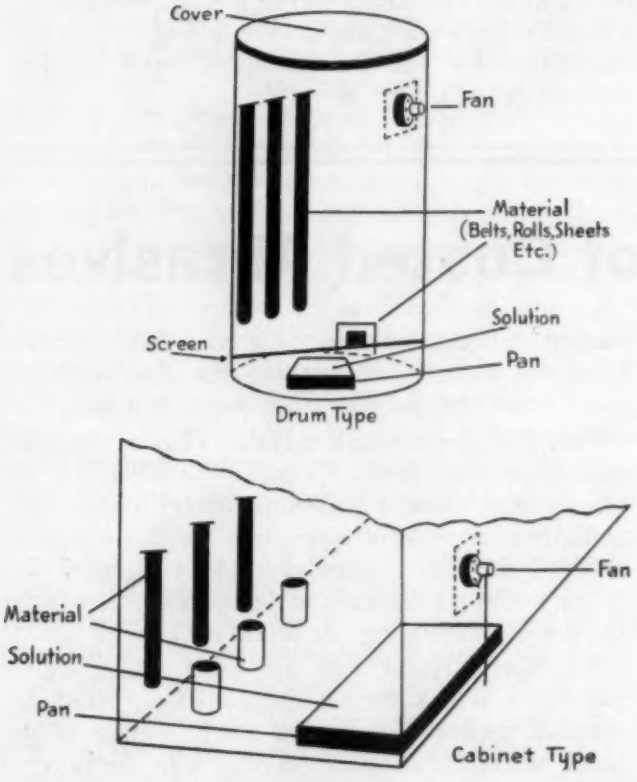
1. Store coated abrasives on pallets, in bins or on shelves, out of direct sunlight.
2. Leave the coated abrasive materials in their original packages until ready for use to modify the effects of rapid changes in temperature and humidity.
3. Avoid use of storage areas which might be subjected to alternate hot and cold, or wet and dry cycles.
4. Store coated abrasives away from heating equipment or steam lines.

Taking such simple storage precautions will pay



Excessive dryness can cause cupping of the coated abrasive.

Humidity Control Units for Coated Abrasive Storage



off in continued optimum service from coated abrasives. It has been noted, for example, that glue bond papers have been stored for 10 years at approximately 50% relative humidity and 70-degrees F., without noticeable deterioration.

For geographical locations subject to rapid or extreme seasonal changes in climatic conditions, good coated abrasive storage can be provided through the use of cabinets or entire rooms, depending on the volume of coated abrasives consumed. Such storage facilities range from a simple 55-gallon drum or air-tight metal cabinet to a walk-in unit.

The smaller type conditioner is made by placing an enameled pan about 9″ x 18″ x 2″ in the bottom of the drum or cabinet. The pan will hold a saturated solution of a humidity control chemical mixed with water. A heavy screen is placed over the pan to prevent the coated abrasives from touching the solution. Necessary air circulation is provided by installation of a small fan in the side of the drum near the top, with the motor on the outside to eliminate chances of corrosion.

The cover of the container should fit tightly, yet allow easy access. Flat-type stock (such as sheets and discs) are placed on the screen for conditioning; short belts are hung on hooks attached to the inside of the barrel.

It should be noted that it takes a minimum of about three days to condition coated abrasives which have been affected by humidity. Therefore, it is necessary with the smaller type of unit to anticipate future needs for coated abrasives and place them in the conditioner accordingly.

Potassium carbonate has been found to be a highly effective chemical for humidity control since its humidity range centers at about 43%. It is low in cost, and it can be handled easily with normal caution. One tray of potassium carbonate properly maintained in a saturated solution will control between 40 to 50 cubic feet of air.

(A saturated solution is one having an excess of undissolved crystals. "Proper maintenance" includes retaining the saturation in high humidities, and adding water at low humidities.)

Other relatively harmless chemicals and the humidities which can be expected from each are calcium chloride, 32%, and sodium dichromate, 52%.

Where coated abrasive consumption is such that a walk-in storage unit is desirable it is advisable to call in air conditioning specialists to make recommendations for proper equipment.

For checking humidity readings a direct-reading humidity instrument is acceptable; however, a stationary wet and dry bulb humidity gauge is the most effective instrument. Wet and dry bulb readings are simply converted to relative humidity.

In the large room, relative humidity is most accurately measured with a sling psychrometer. ● ●

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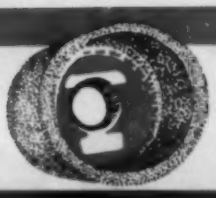

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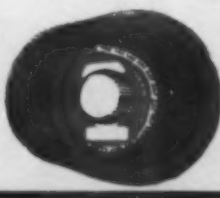

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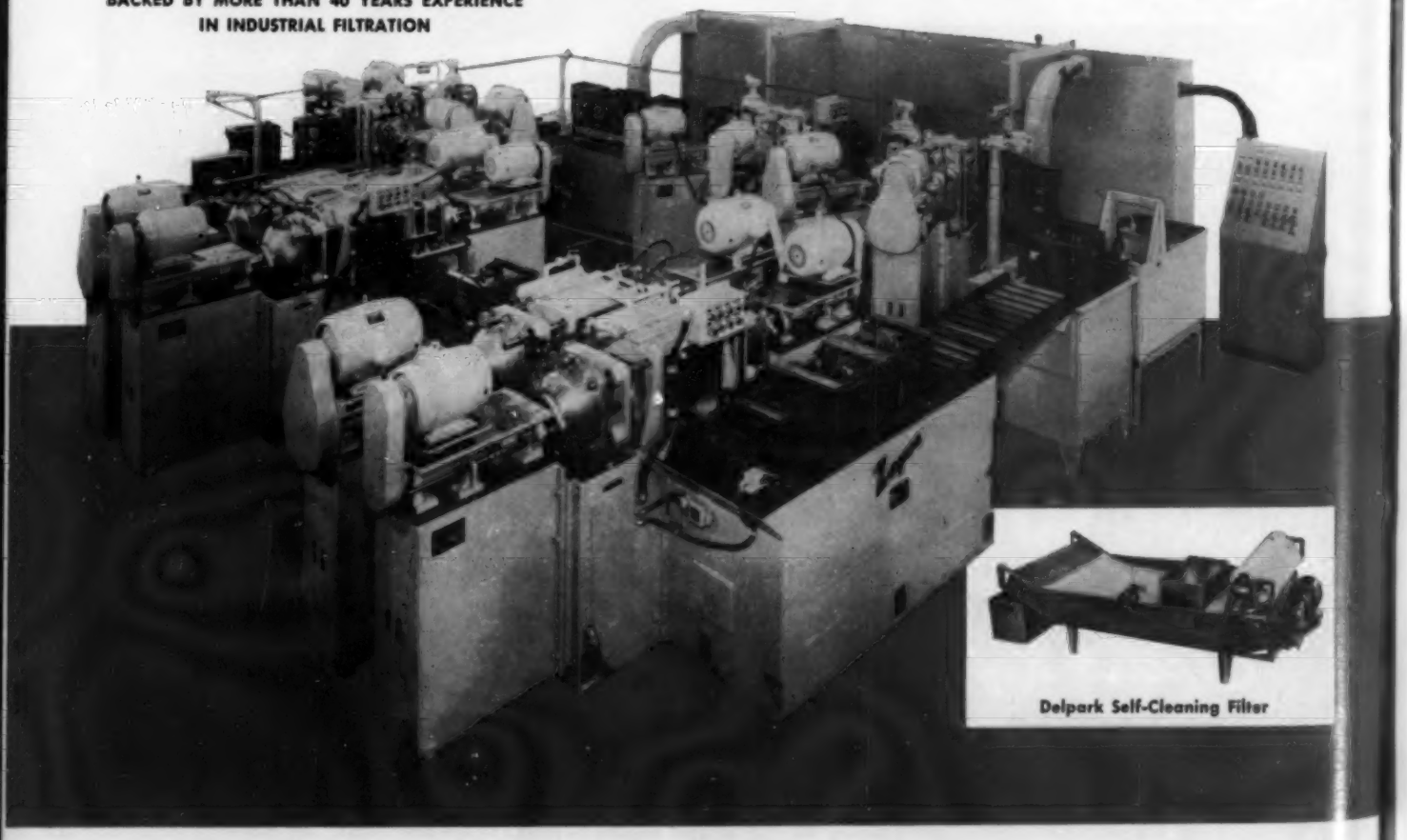

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Tool and Cutter Grinding Department

Principles of Motion Economy Applied to Grinding of Drills

By **John Rogers**

● IT IS a well known fact that the principles of time study and motion economy have been applied to production jobs to a great extent and with excellent results. A good example of what can be done along the same lines for non-productive jobs, as for instance drill sharpening, is shown here:

Dull drills, returned to the tool crib had been collected in a box without regard to size. Collets that were to be used for holding these drills in the drill grinder had been stored on a rack. The operator had to spend a large amount of time sorting drills and looking for matching collets before he could start sharpening. Consequently, more time was expended in sorting and matching than in actual grinding.

To reduce waste time and motion a rack was constructed for both sides of the small drill grinder in front of which the operator was seated. Cross bars that connected the rack sides with the grinder stand serve as foot rest for the operator. The racks are designed for compartments, four wide and twelve high. Each pair of compartments is provided with a small bracket that holds a collet. One compartment of each pair holds the dull drills of a given size, while the neighboring compartment holds the sharpened drills of the same size. The collet stored next to the pair matches the size of the drills stored in the neighboring pair of compartments.

When dull drills are received they are stored immediately in the proper compartment. (Sizes are

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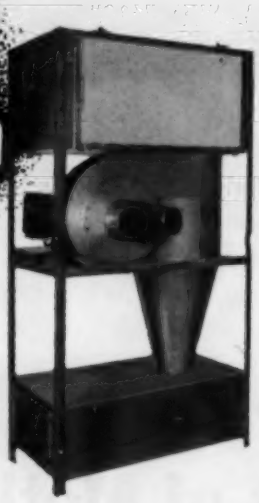

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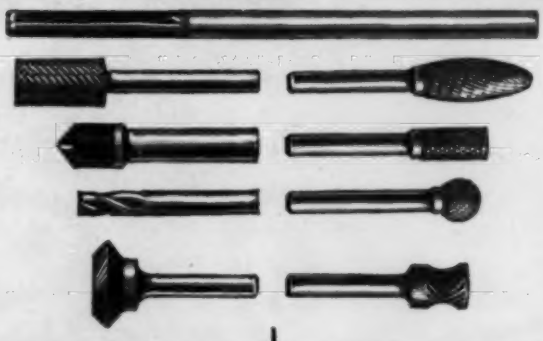

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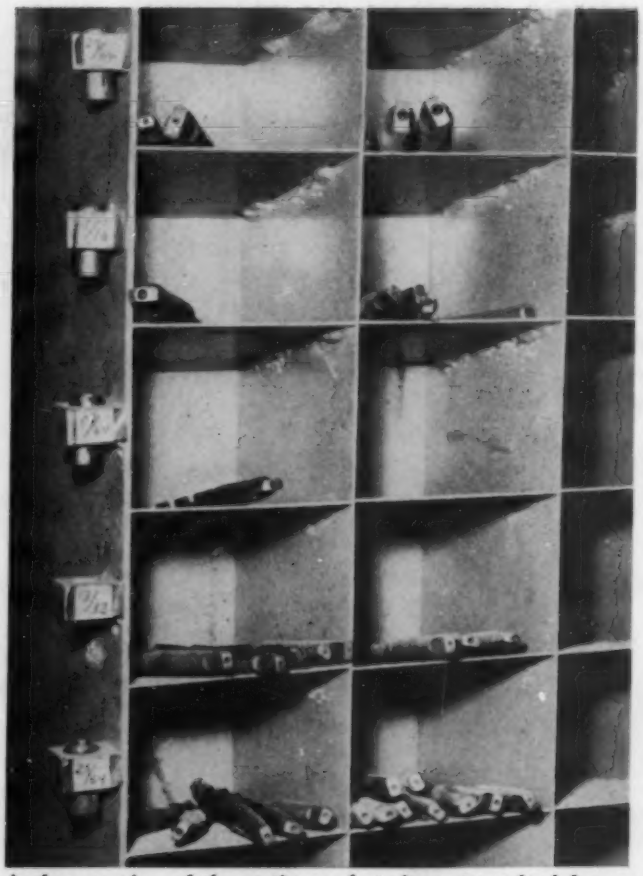
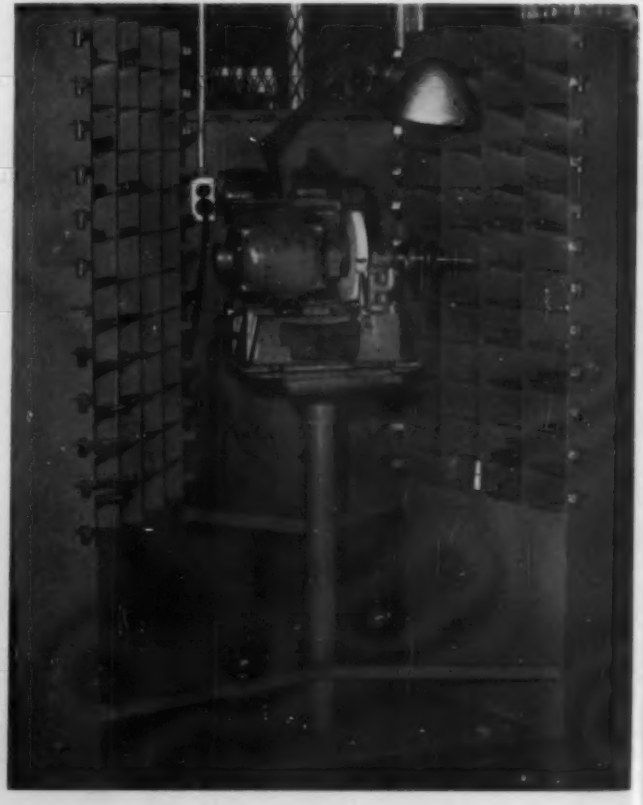


A close-up view of the sorting and storing setup; the left one of each pair of compartments carries the dull drills, while the right one receives the drills after sharpening. Note brackets on left edge which store the collets. Brackets are labeled with drill and collet sizes.

Drill grinder is mounted on simple stand which is connected to the double-sided compartmentized sorting and storing rack. Bottom braces serve as foot rest for operator who is seated in front of drill grinder.



listed on the brackets that holds the collets.) The operator, when ready to sharpen drills, removes all drills from one compartment with one hand and the matching collet with the other. He places the dull drills in one of the two curved trays in front of the grinder, inserts one dull drill in the collet and proceeds to sharpen the drill. Sharpened drills are placed into the other curved tray in front of the grinder until the batch is completed. He then returns the completed batch into the "sharp" compartment and replaces the collet into the bracket.

It can be seen clearly that an orderly process is followed with a minimum of searching and waste time. A further advantage is that the supervisor can see immediately the status of the entire grinding project by scanning the various compartments.

Sharpened drills are returned to their regular storage place in batches or, if desirable, the rack itself can be used as a storage place if the grinder is located near the crib window. ● ●

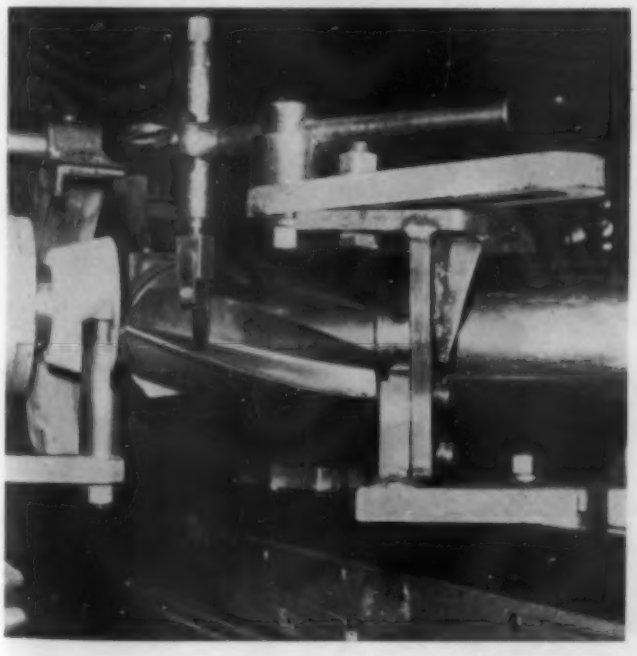
Improved Method of Grinding Core Drills

By **Gordon Johnson**

For best performance of larger core drills it is often necessary to sharpen the lips in relation to the taper shank rather than to the customarily used center holes. We have found the method described here rewarding inasmuch as life of drill, accuracy of hole diameter and number of holes per grind are concerned.

The simple fixture shown in the photograph was designed and built just for this purpose: Two

This is the operator's view when grinding core drills with this special holding fixture. Note "finger" being mounted on a bracket which is part of the fixture.



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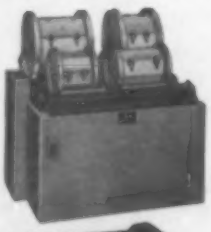

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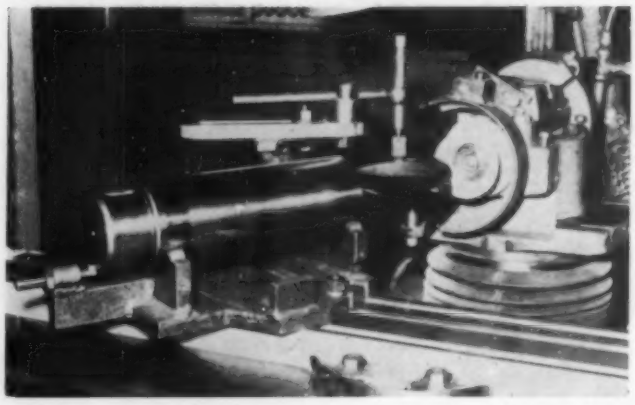
accurate Vees were machined into a well stress-relieved weldment. These Vees were fitted with hardened and ground wear strips. The bottom of the fixture was provided with keys at the proper grinding angle so that the fixture could be set up in a standard tool and cutter grinder with a minimum of lost time.

A hardened and ground sleeve with a Morse taper hole inside and a straight turn outside serves to hold the core drills. A cross slot is used to eject drills with help of a drill drift. An adjustable screw takes up the thrust of the drill.

The sharpening procedure is simple and fast: With one hand, the operator holds down the sleeve and at the same time exerts pressure against the "flute-finger" and against the thrust stop while the other hand traverses the grinding table. ● ●



Special core drill sharpening device set up on universal cutter grinder; three-fluted drill is held by its own Morse taper shank within the sleeve. Note adjustable thrust screw in back of sleeve. Fixture is mounted on table with keys giving accurate location relative to grinding angle.

Simple Lapping Setup for Carbide Tools

By **H. G. Frommer**

Tests have proven that carbide tools will give more pieces per grind when the cutting edges are finished smoothly as the carbide will not break down as fast as when surface irregularities are present. A smooth finish can be accomplished by grinding with a series of wheels with progressively finer grit or by lapping after grinding without the benefit of fine-grit wheels.

Lapping setups can be made quite simply as illustrated here: A double-end pillow block with a V-belt sheave between the two shaft ends is mounted on top of a simple sheet metal stand. A slot thru the stand permits the belt to be driven from below. A small motor (in this case, 1/3 HP and 1750 RPM) is fastened on a hinged plate and the weight of the motor serves to keep the belt tight.

Two lapping disks were used, one for roughing and one for finishing. (The disk material, disk size and disk speed

(Continued on page 55)

HANCHETT new HY-POWER grinder
for
SHEAR BLADES · KNIVES · FLAT SURFACES

HYDRAULIC TABLE DRIVE
MOTORS: 30 h.p. to 75 h.p. CAPACITY: 60" to 296"
GRINDING WHEELS: 30" or 36" diameter segmental
FULL AUTOMATIC CONTROLS • POWERFUL • ACCURATE
HANCHETT MANUFACTURING COMPANY
World's Largest Manufacturer of Knife Grinding and Saw Sharpening Machinery
MAIN OFFICE — Big Rapids, Michigan WEST COAST — Portland 1, Oregon
HANCHETT GRINDERS BIG RAPIDS MICHIGAN

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100% more pieces per grind
300% less tools required per job
400% savings in monthly tool cost

the superiority of ELOX electrical discharge grinding was proved by this large automotive company's unsolicited 2-month comparison report!**

Tool Name, Description:	Solid Carbide Insert	
Part Name:	Crankshaft	
Operation Name:	Finish Front & Rear Thrust Bearings	
	Standard Grind	Elox EDM Grind
TOTAL PIECES PER TOOL	17,290	95,904
MINUTES PER GRIND	21.0	13.75
COST PER GRIND	$ 1.26	$ .83
ESTIMATED MONTHLY TOOL COST	$294.71	$92.19

in writing Elox will guarantee increased tool productivity over any type of abrasive grinding.

Other Elox equipment available to remove broken taps, drills, etc., from $495 to $3450.

elox* corporation of michigan

**Comprehensive report and company name given on request.
*T. M. Reg.

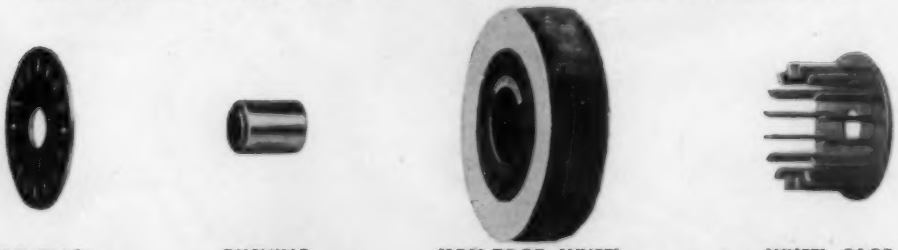
720 N. ROCHESTER ROAD • CLAWSON, MICHIGAN

Encircle No. A1 on card opposite page 70

Behr-Manning pioneers an

The KON-TOOR WHEEL is ideal for automatic and semi-automatic straight line and rotary production

AN EXPLODED VIEW OF WHEEL COMPONENTS...



SIDE PLATE **BUSHING** **KON-TOOR WHEEL** **WHEEL CAGE**

The KON-TOOR WHEEL is constructed of numerous segments of double-faced abrasives and is available in face widths 2" to 7" inclusive – Flexible or stiff construction. Multiple wheels can be used for widths over 7".

For the newest in coated abrasives... watch BEHR-MANNING!

entirely new concept in polishing!

...the ALL coated abrasive KON-TOOR® WHEEL

CAN BE SHAPED TO CONTOUR

Note how the KON-TOOR WHEEL hugs the radius of this stainless steel cooking utensil.

PRODUCES FINER FINISHES

An intricate radius on a pressure cooker cover gets polished by a 2" face KON-TOOR WHEEL.

MINIMUM LUBRICATION REQUIRED

It cuts cooler all the way – A 2" face KON-TOOR WHEEL polishing a drawn steel coffee pot.

CUTS FINISHING COSTS

Polishing production soars with the KON-TOOR WHEEL on jobs like this aluminum stamping.

EASY TO USE

Complicated conversion factors are eliminated. The KON-TOOR WHEEL is easily adapted to standard lathes and work-holding fixtures.

IT'S WEARABLE TOO!!!

Stands up to production for days and weeks instead of hours – note wheel at left still producing after days on the job.

● For details, contact your local Behr-Manning Field Engineer, or write today to Behr-Manning, Troy, N.Y., Dept. GF-9.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

D-15

BEHR-MANNING® division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE SENSITIVE TAPES

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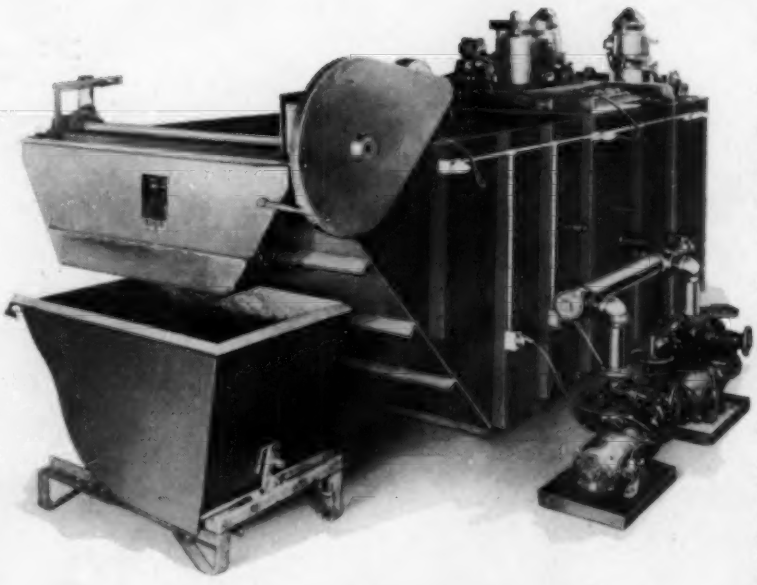
HOFFMAN'S ENGINEERED SYSTEMS designed to do the tough jobs in industry

KEEP COOLANTS CLEANER • REDUCE WHEEL DRESSING
CUT COSTS WITH A HOFFMAN FLOTATION SYSTEM



If your plant is a volume user of soluble oil and water coolants–20 gallons or more–there's money for you in Hoffman coolant clarification systems.

The Hoffman fully automatic, unattended flotation unit is connected to every machine sump, collects coolant after it flows *once* over the work–removes every trace of grit, muck, or chips–and returns it to the coolant supply.

Cutting tools stay sharp, and grinding wheels stay clean longer, work faster and closer, and there is far less down time for maintenance. Coolant replacement practically disappears. *Production increases!*

In the Hoffman clarifier, an exclusive aeration-flotation system lifts the "fines" to the top in froth. Mechanical skimmers carry this foam into settling tank where solids settle to the bottom. The sludge is dragged up an incline for drainage, and is discharged in near-dry state.

To learn how much dollar return your plant can get through Hoffman coolant clarification . . . and through other industrial filtration systems . . . write for technical bulletins and a Hoffman Filtration Engineer's survey. No obligation.

U.S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIVISION
DEPT. G.F. 105 FOURTH AVENUE, NEW YORK 3, N. Y.

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Multistage Centrifugal Blowers and Exhausters
Pneumatic Conveying Equipment
Industrial Vacuum Cleaning—Portable and Stationary Systems
Continuous Metal Strip Driers
"Smoothflow" Fittings and Tubing

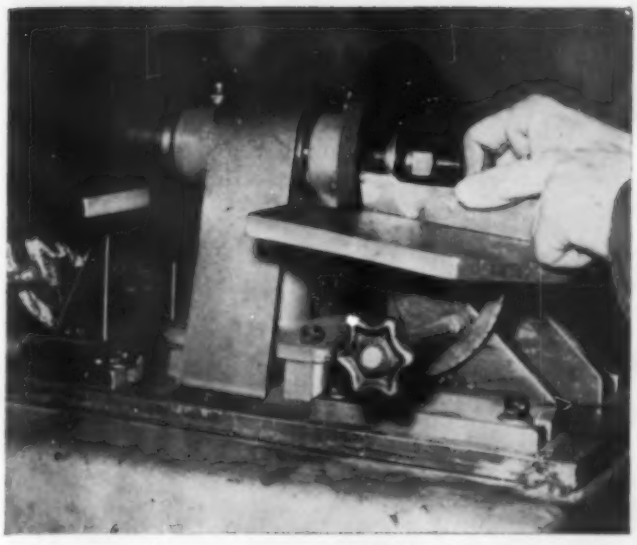
METAL FINISHING DIVISION

Mechanized Metal Cleaning and Phosphatizing Systems
Chemical Plating Equipment
Electrostatic Spray Painting Equipment
Paint Booths and Bake Ovens
Filters for Phosphate and Plating Solutions—Waste Disposal

ORDNANCE EQUIPMENT DIVISION

Special Pneumatic Conveying Systems
High Efficiency Centrifugal Separators
Stationary and Portable Vacuum Cleaning Equipment
Process Equipment
Pneumatic Systems for Radioactive Materials

Encircle No. A3 on card opposite page 70



A lathe tool is being honed; note tilted table and tilt locking arrangement. Bottom bracket is also slotted to allow table adjustment to and away from the lapping disks. Belt is guarded with sheet metal strip.

(Continued from page 50)

as well as the diamond concentration of the lapping compound are specified by the supplier of the lapping material. The specifications vary under different conditions and for different applications and a detailed analysis would exceed the scope of this article.)

The work tables extend over both sides of each wheel to allow for the lapping of both right hand and left hand cutting tools. Further, to enable grinding of right hand and left hand tools, the motor must be wired so that it can be reversed. The work tables are welded to vertical plates that hold the hinge pins and that are slotted to allow varying the lapping angle. Locking is achieved by long, shouldered bolts with start knobs. A sheet metal guard covers the belt.

Each work table hinges on a bracket which is bolted to a base which, in turn, is welded to the top of the stand. These brackets are also slotted, these slots permitting slight re-adjustments of the work tables with respect to the lapping disks.

Lapping arrangement is mounted on table made of thin angles and sheet metal. Motor is mounted on sheet hinged to table leg with standard hinges that are welded. On-Off switch and reversing switch are mounted side by side. Weight of motor keeps belt under tension.

FOR
EMPLOYEES' SAFETY
USE
MORRISON
REVOLVING CUP GUARDS

on all portable grinders, using flaring or straight cup wheels.

Stringent Safety Codes and Laws DEMAND IT.
Consideration of Employees DEMAND IT.
Good Business DEMANDS IT.

MORRISON GUARDS have all been developed in collaboration with the Safety Committee of the Grinding Institute.

MORRISON REVOLVING CUP GUARDS offer maximum safety—highest visibility—lightest weight—greatest strength—and lowest cost.

In case of wheel breakage, hundreds of tests prove that Morrison Revolving Cup Guards hold pieces until machine can be stopped.

Guards for every portable grinding wheel. Write for literature.

MORRISON PRODUCTS Inc.
16816 WATERLOO ROAD CLEVELAND 10, OHIO

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FREE TRIAL OFFER
NO STRINGS ATTACHED

6 LIBERAL JARS
DIFFERENT GRADES

A VALUABLE KIT
Carton contains 6 grades of silicon fine quality, assorted fine grit abrasive compounds suitable for a variety of work. Coarser grit compound can also be supplied.

FOR PRECISION LAPPING

Here's a get-acquainted offer you cannot afford to miss. Among these samples will be found the answer to many a tool room lapping problem. Hard and soft abrasives for all kinds of lapping needs. Sent post paid anywhere in the U.S.A. and Canada.

OFFER LIMITED to those writing on company letterhead

No obligation—write today on your company letterhead.

PROVE THEM AT OUR EXPENSE!

UNITED STATES PRODUCTS CO.
515 MELWOOD ST. PITTSBURGH, PA.

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Grinding Titanium With Coated Abrasive Belts

By **Dr. Hugh N. Dyer**
Director of Product Testing
Behr-Manning Div. Norton Company
Troy, N. Y.

● UNLIKE other structural metals, titanium has unusual chemical and physical properties which pose certain problems when grinding it with coated abrasive belts. Titanium is so reactive at the temperatures generated in grinding that abrasive grains rapidly become dulled or flattened because of partial solution in or chemical reaction with the hot metal. These grains, dulled by attritious wear, then slide over the surface of the metal, creating additional heat but doing little useful cutting.

Successful grinding of titanium with abrasive belts depends upon reducing attritious wear by lowering the temperature at the grinding point and by using grinding fluids which form protective films over the freshly cut metal surfaces. Desirable fracture wear, which exposes fresh cutting edges, is promoted by using the right belts at the right speeds with the right contact wheels and grinding fluids.

Use the Right Belts

Silicon carbide coated abrasives give the best results in grinding and finishing titanium. Paper-backed belts, used either dry or with an oil or grease, are suitable for some flat sheet work. Where the backing must be more rugged, cloth-backed belts are used. Synthetic resin bonds provide maximum durability. When water-base grinding fluids are used, fully waterproof cloth-backed products are necessary. Grits 40 to 80 are recommended for roughing and spotting operations, and grits 120 and finer for high finishes.

Belt Support

The contact roll supporting the belt should be as small in diameter and as hard as practicable. This provides almost line contact and high unit pressure between abrasive belt and work. Heat build-up, dulling, and glazing are reduced, and fracture wear is promoted by using hard rubber, plastic or metal contact wheels. Flat shoes or platens, and soft rolls usually lead to rapid belt failure from dulling. An exception is the use of a softer rubber roll for blending and spotting, as in the removal of small defects in sheet or coil, either before or after final reduction.

Belt Speed

A very low belt speed reduces the temperature at the grinding point, retards reaction between metal and abrasive grain, and promotes fracture wear. When a grinding fluid is used, speeds between 1500 and 2500 sfpm are recommended. For dry grinding, speeds between 1000 and 1500 sfpm give good results. Low belt speed also reduces the tendency for the sheet surface to be scorched or marred by accumulations of incandescent chips.

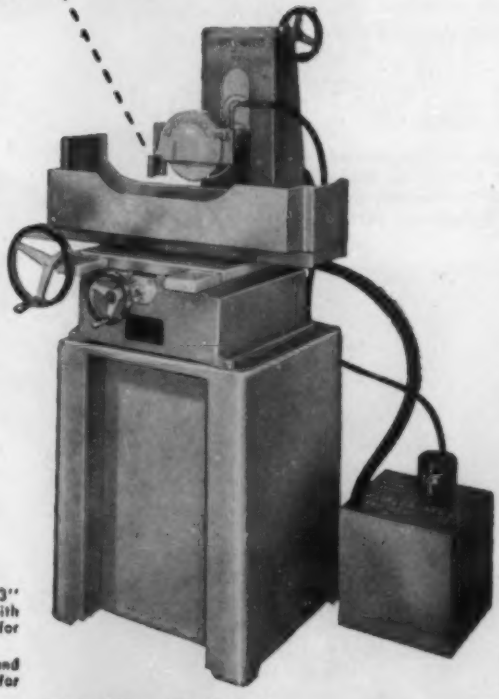
Grinding Fluid

Grinding fluids, in addition to cooling and quenching the spark, can reduce the reaction between metal and abrasive grain. A grinding fluid should always be used when taking continuous cuts over fairly large areas. For interrupted cuts, such as spotting defects in sheets or bars, or offhand grinding of small parts, dry grinding at speeds not exceeding 1500 sfpm will give good results.

Heavily sulfurized and chlorinated cutting oils are good grinding fluids, and can be used with nonwaterproof coated abrasive belts. Because of the extremely hot spark obtained in titanium grinding, only oils of the highest flash point (above 325 F) should be

SANFORD
SURFACE GRINDER
MODEL MG

For Dry or Wet* Grinding!
PRECISION • SPEED • SENSITIVITY



Built by manufacturers who concentrate on small grinders only, each Sanford Grinder is an individual project of time tested and proved basic design. Although modest in price, no quality undermining shortcuts are employed to reduce manufacturing costs. Constant repeat orders prove its acceptance.

This sensitive machine grinds to micro-inch accuracy with no vibration, with maximum dimensional stability. Here's why:

- Transverse ways are double Vee (VV) Meehanite inserts instead of flat surfaces which depend upon unstable jibs for alignment and accuracy.
- Needle, Ball and Oilite Anti-Friction bearings are used throughout.
- Alignments are electronically checked for accuracy.
- Precision slides are ground, lapped and hand spotted.
- Dials are large and legible.

SPECIFICATIONS — 8¾" transverse — 13" longitudinal — 12" vertical under 7" wheel with Adapter. Approximate weight 630 lbs. Send for illustrated bulletin.

Replacement parts, special attachments and reconditioning facilities are available. Send for price list.

*With optional equipment

SANFORD MANUFACTURING CORP.
1026G Commerce Ave., Union, N. J.

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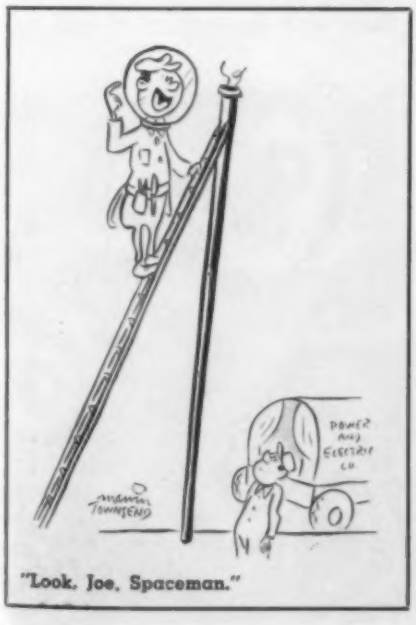
used. The fluid should be introduced close to the grinding point for rapid spark quenching, and any exhaust or dust collecting system must be designed to minimize the fire hazard.

Water-base grinding fluids present no fire hazard and are relatively inexpensive, but they do require the use of waterproof coated abrasive belts. Conventional soluble oils in water are poor grinding fluids for titanium, but may sometimes be useful where the alternative is grinding dry at speeds in excess of 1500 sfpm. Rust inhibitors of the nitrite-amine type give good results when used with water. Among the most effective water-base fluids found so far are 5% solutions of sodium nitrite or barium nitrate. Since all water-soluble barium compounds are poisonous if swallowed, and since contact with eyes or skin should be avoided, barium nitrate is not recommended for commercial applications.

There is not very much information available at the present time on the economics of grinding titanium with coated abrasive belts on a production basis. However, it is estimated that, under good grinding conditions, it will cost approximately six to ten times as much per cubic inch of titanium metal removed as it would cost to remove the same volume of stainless steel.

Improvements and new developments in machine tools using coated abrasives, and in grinding fluids, will undoubtedly reduce grinding costs. Even at present costs, the abrasive belt grinding of titanium and its alloys is giving excellent results at costs competitive with other methods of stock removal. These recommendations are applicable for grinding either commercially pure titanium, or other common alloys.

● ●



"Look, Joe, Spaceman."

A TRANSPARENT ALL-CHEMICAL SOLUTION FOR GRINDING

Lusol K-7 is a new all-chemical liquid concentrate designed for a wide variety of grinding operations. It is recommended for use on all steels and is particularly suited for cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Instantaneously soluable in any water, hard or soft, it forms a clear, transparent, colorless solution that resists contamination, settles chips super-fast, and remains clear after repeated use. It is non-foaming and runs absolutely flat under all conditions. It provides maximum rust protection for all ferrous metals, including cast and malleable irons. It maintains clean wheels at all times. They just don't load up when you use Lusol K-7. For better grinding every time, use Lusol K-7. Write for complete information.

THE Lusol LINE

. . . BETTER PRODUCTS FOR BETTER METAL WORKING

F. E. ANDERSON OIL CO., INC.

PORTLAND, CONNECTICUT

5A055

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Available Literature

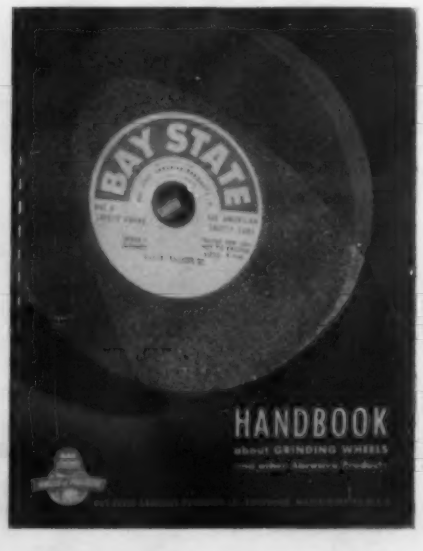
Catalogs and Bulletins Available from Manufacturers

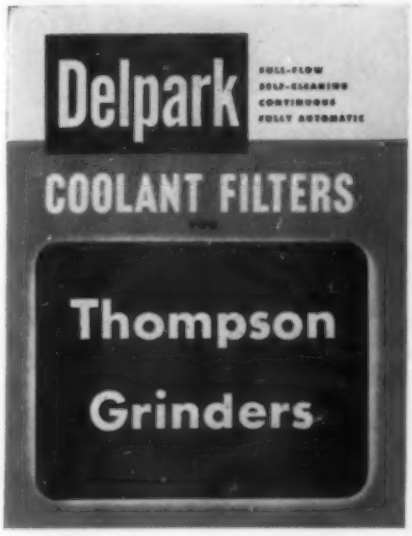
For copies of the literature in which you have an interest use the postage-paid postcard. Merely circle the identifying number and mail the postcard.

1. Wheels and Abrasives Handbook. Bay State Abrasive Products Co., Dept. GF, Westboro, Mass., has just published its new Grinding Wheel Handbook. The handbook gives basic knowledge of grinding wheels, abrasives, bonds, and structures. General principles of grinding and the dressing and truing of wheels is described and illustrated. Recommended specifications for different applications are included in this 96 page handbook.

2. Machine Tool Financing. Bryant Chucking Grinder Co., Dept. G, Springfield, Vt., is now offering a folder describing the various financing plans available to purchasers of Bryant internal grinders and precision boring machines. The folder discusses both short and long-term conditional sales plans, covering such points as types of equipment eligible, down payment, installments and finance charge. Details of Bryant's lease plans are also given.

3. Portable Tools. Catalog No. 905-3, issued by the Chicago Pneumatic Tool Co., Dept. F, Six E. 44th St., New York 17, N.Y., describes and illustrates their 360 cycle, 3-phase, 220 volt, Super Cycle Tools. Their complete line of high production tools for drilling, sanding, grinding, buffing, polishing, nut running and screwdriving are discussed along with specifications of each tool.

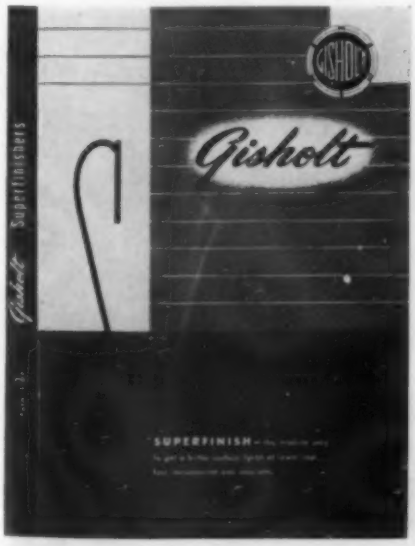




4. Tool and Cutter Grinder. A six page catalog describes Thorns universal T2 tool and cutter grinder. Includes specifications, technical information, illustrated section on applications, description of Helix grinding equipment and special equipment available. Homestrand Inc., Dept. GR, Larchmont, N.Y.

5. Coolant Filters. Industrial Filtration Co., Dept. GG, Lebanon, Ind., has released a 4-page folder describing and illustrating the Delpark Coolant Filter and the maximum coolant control it gives for Thompson Grinders. The filter is said to be a continuous, self-cleaning gravity filter. It filters solids from liquids that will flow, by gravity, through filter material and discharges the solids, in a relatively dry state, into an outside container.

6. Tumbling Barrels. The Henderson Bros. Co., Dept. FG, Waterbury, Conn., has released a 20-page catalog covering their complete line of tumbling barrel equipment. This illustrated catalog gives complete specifications and outside dimensions of each machine.



7. Superfinishers. A new catalog recording the progress of superfinishing has just been released by Gisholt Machine Co., Dept. FF, 1245 E. Washington Ave., Madison 10, Wis. It includes a brief description of the process; complete specifications on the 12 machines and five attachments available for this work; plus information and photographs on 28 different job applications.

8. Wheel Dressers. Literature on its "Fluidmotion" line of wheel dressers has been announced by J & S Tool Co., Inc., Dept. F, 87 Dorsa Ave., Livingston, N.J. The illustrated literature describes how the procedure for forming wheels to shape on internal cylindrical and surface grinders and tool and cutter grinders is performed. The Fluidmotion feature which permits dressing two angles tangent to a radius in one continuous motion is illustrated and described.

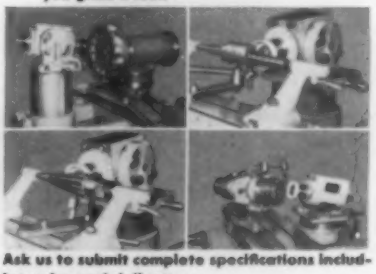
9. Diamond Tools. The Precision Diamond Tool Co., Dept. FG, Elgin, Ill., has released a 4-page folder describing their line of Precision Economy Tools for low cost wheel dressing. The illustrated literature contains technical data and specifications of elongated diamonds, multiple diamond dressers and single point dressers.

10. Centers. Catalog No. G-550-1, introducing two new anti-friction centers

HERE'S A HEAD THAT TILTS
and Yours Will Nod, Too
When You See What
You Can Do With This
One
POPE
SUPER PRECISION 1 HP,
3600 RPM MOTORIZED TOOL AND CUTTER GRINDER
CLEARANCE ANGLE SWIVELLING HEAD
With Angular Adjustment In A Vertical Plane

Give this versatile head the nod and save time and money these seven ways:

1. You can use cup wheels for practically all clearance angles and thus produce a cutting edge on tools that lasts longer because it is stronger.
2. You can keep the tooth rest on the center line of the cutter for practically all grinding on centers or in the work head.
3. You can grind most cutters and reamers all over with a single set-up using the swivelling table and Pope tilting head.
4. You can read all clearance angles directly in degrees from the scale provided on the head. No more mistakes.
5. You can get the right clearance angle on such tough grinding jobs as slab mills, taper reamers, angular cutters and form tools.
6. You have one safe speed — 3600 RPM — for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
7. You have a head that's so easy to adjust and use it saves you time and money every time you grind a tool.



Ask us to submit complete specifications including price and delivery.

No. 101

Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
361 RIVER STREET • HAVERHILL, MASSACHUSETTS

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as well as the line of solid centers for grinding machines has been issued by Ready Tool Co., Dept. G, 554 Iranistan Ave., Bridgeport, Conn. Information on Red-E's shank and spindle type anti-friction centers is listed, explaining the basic bearing design, engineering data and construction features. This cataloged material shows prices and specifications for both full and half solid centers.

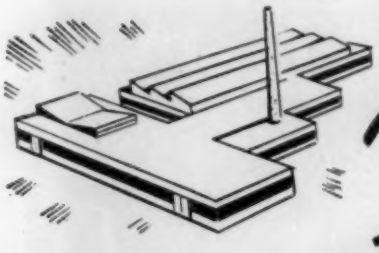
11. Honing Machine. An 8-page folder describing and illustrating their model MBB-1290-D precision honing machine for production, tool room, salvage and maintenance has been released by Sunnen Products Co., Dept. GF, 7910 Manchester Ave., St. Louis 17, Mo. There is a brief general description of honing along with specifications and recommendations for use in different phases of operation. It is said to be a universal honing machine for deburring, stock removal and micro-fitting.

12. Cutting & Grinding Fluids. A booklet available from S. C. Johnson & Son, Inc., Dept. GF, Racine, Wis., describes advantages of wax in metalworking and gives the comparative machinability rating of various steel grades.

13. Universal Grinders. 12" x 3" OD-ID grinder—hydraulic plunge cut or mechanical plunge cut units; completely universal with swiveling wheelhead, workhead and table; 12 x 1½ x 3 OD wheel with 2 h.p. motor. Universal Tool grinder—8" x 12" Wet completely universal radius and spiral fluting from the solid tool grinding and tool lapping machine. 7" wheel capacity. Capable of wet grinding all forms of carbide or high speed steel from the solid or with a finger. Literature available from the American Herforder Corp., Dept. GF, 1801 W. Columbia Ave., Chicago, Ill.

14. Surface Grinders. The Arter Grinding Machine Co., Dept. G, Worcester, Mass., has added two new models to its line of grinding machines. The Model E 12" x 16" rotary surface grinder and the Model F 12" rotary surface grinder. Complete information available from company.

15. Automatic Sorters. The Cleveland Autosort Model 101, for automatic gagging and sorting of parts up to 3" length and ¾" OD at speeds of 3000 per hour or faster, is described in Bulletin 551 available from the Cleveland Instrument Co., Dept. GA, 735 Carnegie Ave., Cleveland 15, O. Checks length, OD, thickness, or any other external dimension; sorts into as many as 5



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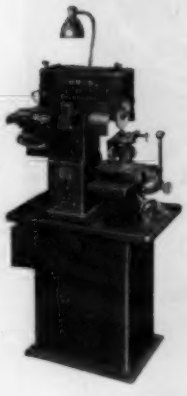
AMERICA'S LEADING
MANUFACTURERS
Hammond
CARBIDE TOOL and CHIP
BREAKER GRINDERS



CB-77 Chip Breaker and Diamond Finishing Grinder.

SAVE TIME · TOOLS · WHEELS with America's "Choice" and most complete line of Carbide Tool, Chip Breaker and Diamond Finishing Grinders. Over 6,000 in service.

Clip this ad to your letterhead and Carbide Grinder Catalog No. 225 will be sent by return mail.

WD-10 Wet or Dry 10" Carbide Tool Grinder.

14-WD Wet or Dry 14" Carbide Tool Grinder.

Hammond Machinery Builders INC.
1651 DOUGLAS AVE., KALAMAZOO, MICH.

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specific size categories plus oversize and undersize.

16. Abrasive Segments and Segmental Chucks. The "True Segment" shape was originated by Cortland for surface grinding. The inner edge of the grinding face of each segment is a straight line, while the outer edge is a true arc, making the grinding area narrow at each end and wide in the center. Information on these abrasive segments and on Cortland segmental chucks, which can be universally adapted to vertical spindle surface grinders, is available from Cortland Grinding Wheels Corp., Dept. GC, Chester, Mass.

17. Driver Balancing Equipment. Complete information on driver balancing equipment for balancing grinding wheels may be obtained from Crestline Products, Inc., Dept. GB, 210 Paramount Bldg., Fort Wayne, Ind. A sensitive ball bearing arbor attaches to and becomes an extension of the spindle; grinding wheel is moved onto the arbor without removing it from the machine; portable and bench model units available for almost every kind of grinder.

18. Chucks. Cushman "Air-Tight" chucks, for wet or dry grinding operations, are completely enclosed and sealed against entry of air, water and dust. They require adapter plates for mounting and are available in 7½", 10", 12" and 14" sizes. Literature giving complete information available from the Cushman Chuck Co., Dept. GC, Hartford 2, Conn.

19. Grinders, Buffers, Polishers, etc. The complete line of portable tools, grinders, buffers and polishers, manufactured by the United States Electrical Tool Co., Dept. GF, 3646 Llewellyn St., Cincinnati 23, O., is described in a catalog available from the company. Line includes 160 separate sizes and designs of grinders.

20. Super Vision Shields. The Surty Mfg. Co., Inc., Dept. GS, 4139 W. Kinzie St., Chicago 24, Ill., has complete details available on their super vision shields. Shield may be adjusted to any position with two universal joints and supporting brackets. Four sizes available for both single and double wheels where wheel centers do not exceed 11".

21. Surface Grinders. The new type D Thompson 6 x 18 surface grinder catalog describes the latest addition to the Thompson line of small precision surface grinders. Details are illustrated in color and complete drawings and specifications are provided. The Thompson Grinder Co., Dept. FF, Springfield, O.

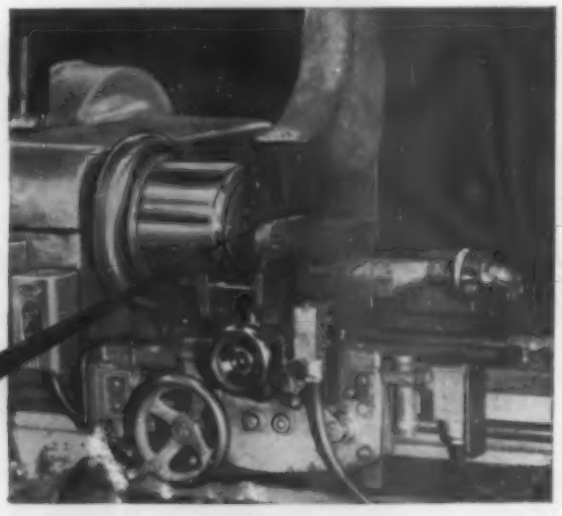
22. Chuck Control. The Neutrolator electro magnetic chuck control is said to provide holding power which permits grinding without shimming, to closer parallelism. Where various tensions are required, a dial or push-button control provides regulation of holding power. A free descriptive folder is available from Electro-Matic Products Co., Dept. FG, 2237 N. Knox Ave., Chicago 39, Ill.

23. Tumbling Abrasive. A new catalog from the Exolon Co., Dept. G, 1002 E. Niagara St., Tonawanda, N.Y. describes their tumbling abrasive for rapid barrel finishing. This hard aluminum oxide grain is claimed to be barrel-finished itself for non-scratch, precision smoothing of metal surfaces.

24. Wheels, Points and Segments. Literature is available from the Simonds Abrasive Co., Dept. GR, Philadelphia 37, Pa., describing their grinding wheels, mounted points, abrasive segments and polishing grain. Free consultation with field engineers is offered.

25. Surface Grinders. Full details are available on Grand Rapids grinders manufactured by Gallmeyer & Livingston Co., Dept. F, 416 Straight Ave., S.W., Grand Rapids, Mich. The No. 55 hydraulic feed surface grinder has table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Also a greased for life preloaded ball bearing spindle with speeds 1925 and 2500 rpm.

Magna-Lock Magnetic Chuck at Wabash Division, Raybestos-Manhattan, Inc.



SOLVES PROBLEM OF HOLDING THIN WORK-PIECE

THE JOB: Machining spiral groove .030" wide, .015" deep with 1/16" space between grooves on steel plate faced with copper friction material.

THE PROBLEM: To hold 1/16" thick copper-faced steel plate firmly on a lathe during the grooving operation.

THE SOLUTION: A Hanchett MAGNA-LOCK Rotary Magnetic CHUCK holds work piece which is machined at a spindle speed of 600 RPM.

THE RESULT: 2,400 pieces machined per 8-hour shift. Scrap and rejects run less than 2%.

Here you have another example of how Hanchett Magna-Lock Magnetic Chucks can increase your machine's productivity.

Magna-Lock offers a complete line of rotary, rectangular, swiveling and vertical face magnetic chucks, magnetic sine chucks, parallels and accessories. Magna-Lock Rectangular Chucks have 22% more magnetic area, permitting work pieces to be held to the extreme edges of the chuck. They are of welded *all-steel* construction, shock- and moisture-proof.

Get Magna-Lock for extra holding power that holds an extra margin of profit for you! WRITE TODAY, Dept. GF-95

Request Magna-Lock as original equipment on your new machines.

Magna-Lock

Hanchett **MAGNA-LOCK CORPORATION**

Magnetic Chucks and Devices

BIG RAPIDS, MICHIGAN, U.S.A.

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26. Diamond Tools. A folder showing the complete line of Diamond Tools is available from Hayfred Co., Dept. FF, 91 Broadway, Springfield, Mass. This includes wheel dressers, both single point and single layer cluster; thread grinders; valve grinders; gear grinders; hardness testers; contact points; shape tools; scribing tools; glass cutters; radius forming tools; and cluster carbide dressers.

27. Chilling Machine. Complete details and specifications are available describing Liquid Chiller from Lundholm Mfg. Co., Dept. FF, 1121 Charles St., Rockford, Ill. The 60 GPM size chiller is said to be compact and self contained taking 26 inches square of floor space.

28. Deburring. The four Sand-O-Flex models are described along with prices in a catalog available from Merit Products, Inc., Dept. GG, 4023 Irving Pl., Culver City, Cal. Sand-O-Flex is attached to a bench arbor for deburring small parts and to a portable electric drill for larger pieces. It is said to hold close tolerances when necessary and will not dig into the metal.

29. Snagging Wheels. Literature is available from Mid-West Abrasive, Dept. G, 510 S. Washington St., Owosso, Mich., describing their snagging wheels. Said to be designed especially for billet snagging, grinding steel and alloy castings, and snagging operations on non-ferrous metal and cast iron they are said to have baked-in shock absorbers and fiber-cushioned arbors.

30. Grinding Wheels. Sterling's Specification Selector and New Pricing Catalog No. 1-55, describing their complete line of grinding wheels, is now ready for mailing. Available from Sterling Grinding Wheel Co., Dept. GW, Tiffin, O.

Grind Metal By Ear?

SKILLED operators have insisted for years that they could grind metal "by ear."

Now a University of Michigan professor has come along to lend confirmation to their claim.

L. V. Colwell today told an audience at the semiannual meeting of The American Society of Mechanical Engineers in Boston (June 19-23) that surface finishes produced on steel by grinding can be improved by high-frequency vibrations.

He added that investigations conducted at Ann Arbor showed that such vibrations reduced the temperature in ground surfaces, reduced the incidence of thermal cracks, and minimized the effects of variations in hardness within a grinding wheel under test conditions.

Professor Colwell described grinding tests in which vibrations of 0.001-inch amplitude at 10 to 18 kilocycles per second were induced between the workpiece and grinding wheel by vibrating specimens with an ultrasonic transducer consisting of a core of thin sheets of pure nickel wound with a copper wire coil in which alternating current was applied.

Surface-roughness measurements and microscopic examinations of the grinding swarf, or dust, obtained during dry grinding showed a 60 per cent reduction of roughness, from 40 to 16 microinches, when grinding hardened 52100 steel with an F-grade aluminum-oxide wheel, 60 grit, vitrified. The depth of cut was 0.002-in. and the cross-feed was 0.050-in. Peak temperature was reduced from 475 to 255 degrees F. as measured by thermocouple and oscilloscope.

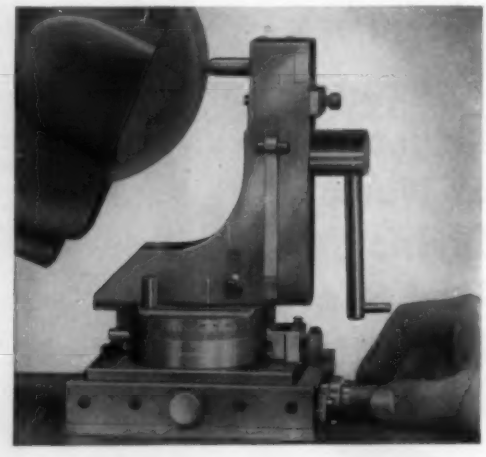
It appeared generally true that vibration caused more wheel breakdown than conventional grinding. This was not unexpected, Professor Colwell said. Studies of grinding ratio have confirmed varying degrees of more rapid wheel breakdown, particularly just after redressing. This was attributed to fewer and smaller built-up edges, and to continuous, uniform redressing which results from fragmentation of individual abrasive grains. ● ●

Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion
WHEEL DRESSERS
dress two angles tangent to a radius in one continuous motion



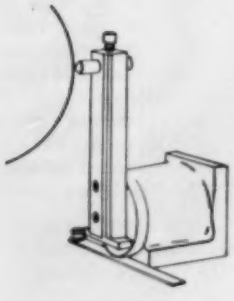
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave. Prices start at

$45.00

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Shop Hints and Short Cuts

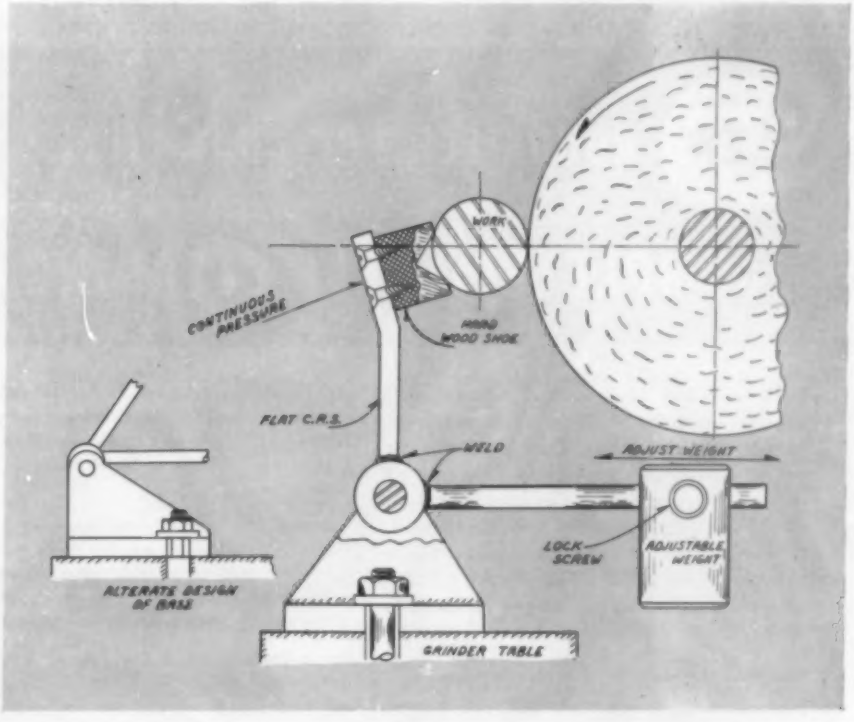
Simple Steady Rest for Cylindrical Grinder

By H. J. Gerber

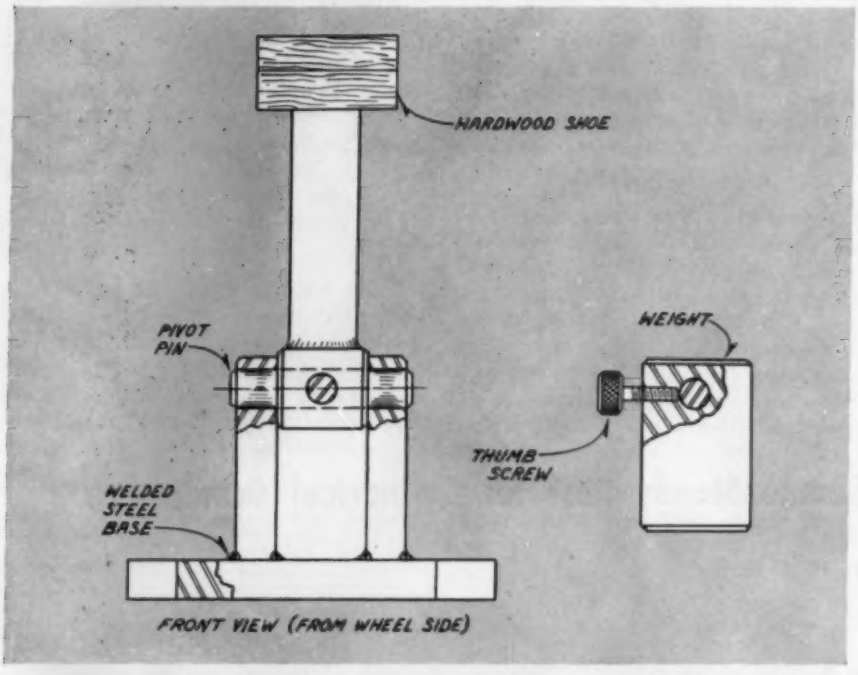
This simple steady rest can easily be built to fit any cylindrical grinding machine. It is adaptable to large or small diameter work and will exert a continuous and uniform pressure against the work with no interference to the wheel.

The pressure against the work is regulated for each individual job by shifting the adjustable weight to a suitable position on the lower arm of the bell crank. When the proper amount of pressure is found, by trial and error, the weight is locked in this position by the thumb screw threaded into the side of the weight.

For fine finishing work a hard maple "V" shaped shoe is recommended.

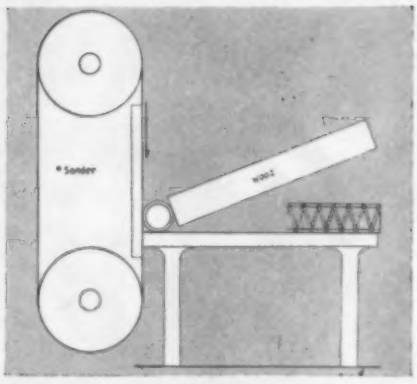


Do you use short cuts in your work? Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.



This steady rest will not usually need re-adjusting, once it is set, as it is self compensating for reduction of work diameter due to removal of stock by the grinding wheel. The pressure exerted by the weight will continue to hold it securely against the work.

Several of these devices may be set up on the grinder table for long pieces of work and in cases like this it is usually found that those nearer the center of the workpiece will require more pressure and therefore the weight will have to be set out farther on the lever arm. • •



Cylindrical Grinding Shortcut

By **Wm. C. Betz**

In the course of making a die, a toolmaker found that shedder springs furnished would not enter the well holes due to their being oversize, and as the die parts were hardened and finished the problem of reducing the diameter of the springs was a "poser."

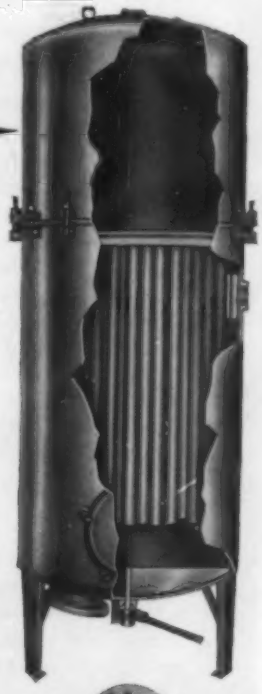
The foreman solved the problem by having the mechanic place the springs on the platen of a vertical sander and with the use of a piece of wood pressing on the spring diameter the parts were reduced in short order. He ground one thirty second of an inch off the diameter of eight springs in less than twenty minutes. • •

FOR WATER BASED AND MINERAL OIL COOLANTS USED IN CENTRAL SYSTEMS

NEW HOUDAILLE PRE-COAT FILTER

—the only filter of its kind that's

COMPLETELY SELF-CLEANING



• An exclusive backwashing feature built into the Houdaille Pre-Coat Filter *eliminates manual cleaning entirely!* During the filtering period, constant pressure forces clean coolant upward into a specially designed dome. By simply stopping pump, this flow is reversed, sending clean coolant from dome down through tubular screens. Every trace of contamination collected on screen surfaces is flushed away in seconds.

Designed for High Flow, High Efficiency
Precision metal-working operations such as grinding, honing and lapping require a constant supply of clean coolant. The Houdaille Pre-Coat Filter provides the fast, thorough *micronic* filtration necessary to meet both production and quality control demands. One or more filters are mounted on a central system tank to handle any volume of coolant.

Features 199 Tubular Filter Screens
Tubular screens are suspended beneath dome on a circular steel plate. Made of fine mesh Monel metal, they provide filtering surface equal to that of flat screens while reducing tank diameter 30%.

Takes Contamination Out, Leaves Additives In
Screens are pre-coated with diatomaceous earth, which removes the most minute solid particles without removing additives. In normal operation, only one pre-coat is needed daily.

EQUIPMENT BULLETIN No. 701 gives complete operating data on the Houdaille Pre-Coat Filter. Write for your copy today.

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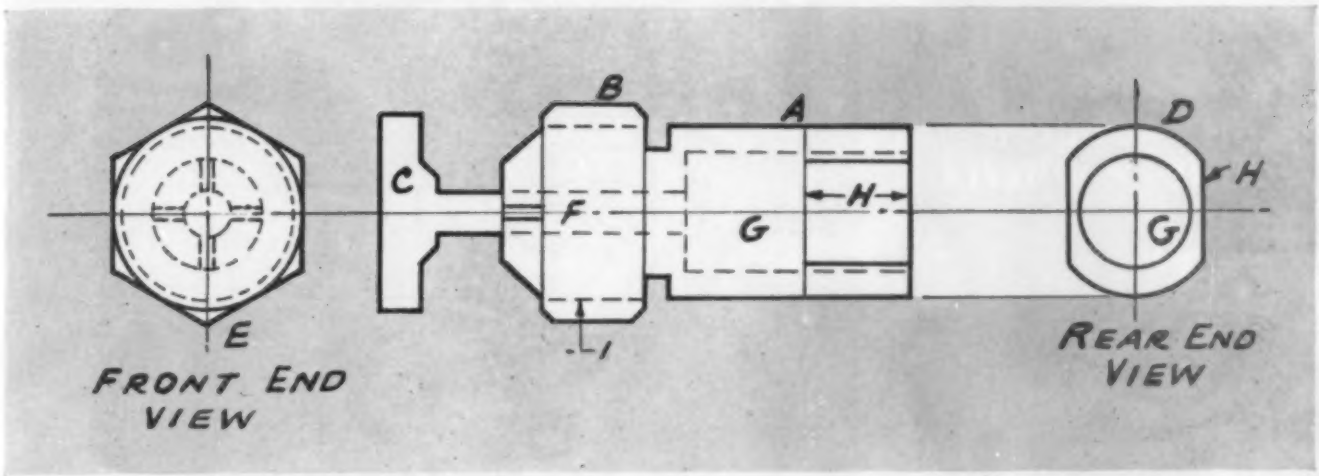


Jig for Grinding Ends of Stock

By **A. E. Salmons**
Dixon Valve & Coupling Co.

The following jig was built in our toolroom to grind the tops of round stock or square stock. It will hold these items in a true vertical alignment. It was built with a tongue in the bottom which is removable. In this way we can grind on the grinder table or on a magnetic chuck. Cuts in the side of the block are 45° and 60° to accommodate round or square or hex stock. It has a C-clamp arrangement.

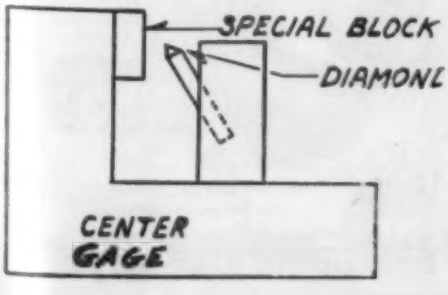
A-45°; B-60°; C-Clamps; D-work holding bolts; E-to secure jig to grinder table. F-to hold clamps to jig; G-jig can be turned over to grind flats or slots in diameter of taps or stock using this hole. H-holes to secure grinding wheel diamond dresser.

The fixture will also hold flat stock that will fit between clamps or extend beyond 45° and 69° openings. It is a very handy fixture and we have done many jobs with it. • •

Diamond Dresser Time Saver

On certain grinders, when sharpening cutters with a radial face, it is necessary to set the diamond dresser on dead center. This is done with a gage that comes with the grinder. But cutters that have a rake or hook angle on the face require the diamond dresser to be set back of dead center. Since the rake angle is often given in thousandths of an inch, it becomes necessary to use a feeler gage with some appropriate piece of metal to insert between the diamond and the face of the gage.

As a time saver in making this adjustment, Theodore Brownell, an Allis-Chalmers tool cutter, made small metal blocks of the exact width or thickness needed for each angle. Now when he gets a cutter with a rake angle, he simply takes the block made for it and quickly and easily sets the diamond. • •



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Specifications for tolerances and finishes are often beyond the control of the shop man. In case after case where this was a problem, Sunnen Honing Machines have helped break production bottlenecks, eliminate scrap and salvage costs.

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Diameter range ⅛" to 2-½". Surface finishes to 2 micro-inches RMS. Accuracy to .0001". Price averages less than $1,000, installed and in operation within three weeks.

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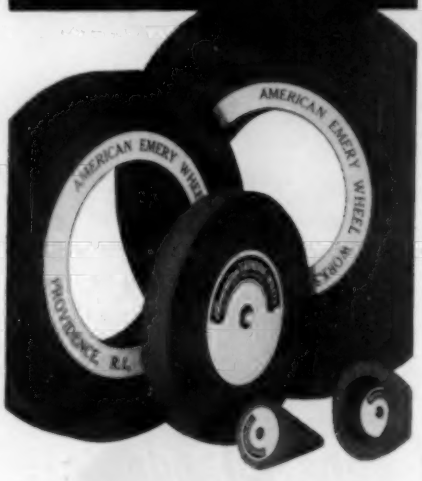
"American"
HIGH PRODUCTION
FOUNDRY WHEELS



METAL-EATERS TO SNAG JOBS FASTER AND MORE ECONOMICALLY!

Rough grinding at lower cost . . . fast stock removal . . . more output per man hour — you get 'em all when you use "American" high speed foundry wheels! Operators are enthusiastic about the ability of these wheels to hog-off surplus metal faster . . . and they like "American" cones for those hard-to-get-at places. "American" High Production Foundry Wheels, backed by long experience in this field, are available in a large variety of abrasives and structures assuring you a selection of ideal snagging wheels for economical operation. Write today for further information.

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Please send me information on "American" wheels for snagging operations.

Name _____
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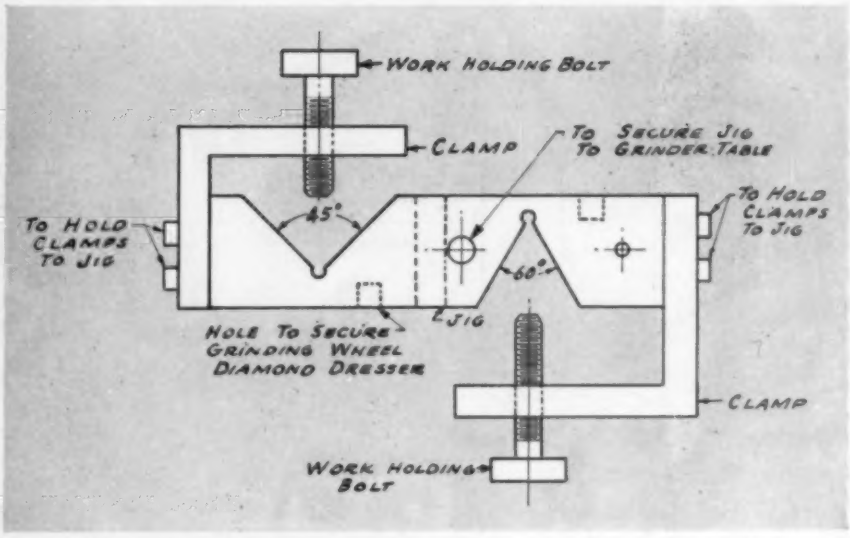
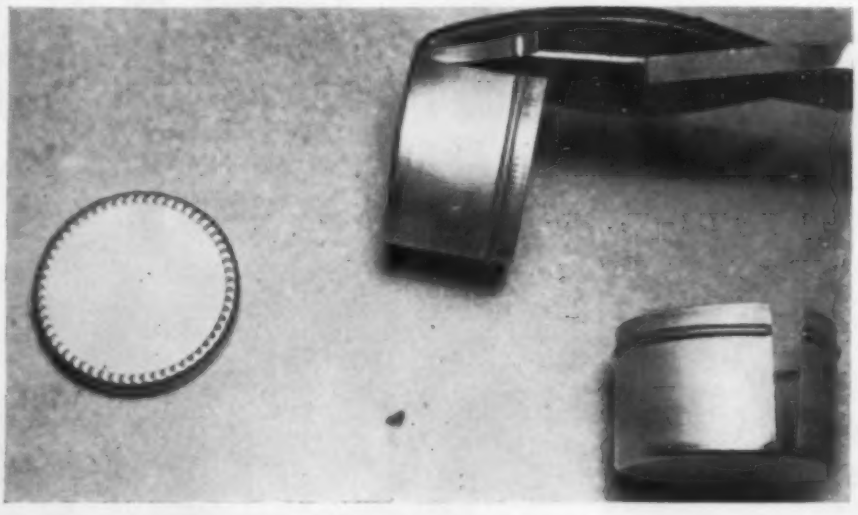


Holder for Small Grinding Wheels

By **A. E. Salmons**

The accompanying sketch is a holder for small grinding wheels and made to fit the main spindle on a universal grinder. With this we can grind very small areas. The fixture is approximately to size, maybe a trifle larger. The Hex Nut tightens collet-style on grinding stick. • •



Handy Containers for Strip Abrasive Cloth

Most machinists like to keep an assortment of various grades of strip abrasive cloth in their tool boxes. In order to store small quantities of this material in the most convenient manner I have modified a number of common tin ointment boxes. A slot sheared in the side of these boxes

The "MASTER COMPAR" INDICATING MICROMETER COMPARATOR
has the VISIBLE feel

No Arguments as to correctness of reading due to "feel".
Use it as Comparator, Master Micrometer, Go & No Go Gage.
1" Range reading in 1/10,000"

To attain permanent accuracy at these close limits, highest precision workmanship and exclusive design of mechanism are of Major Importance — and ONLY found in "MASTER COMPAR."

A RIGHT HAND TOOL
Release button for movable Anvils on RIGHT Hand side enables you to hold tool the conventional way.
NEW — Resetting to Zero in 5 seconds
Quick adjustable tolerance bands. Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Ovalness and Taper.

0-1" SIZE IN HARDWOOD CASE
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Also Available in LARGER SIZES
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provides for convenient removal of any desired length of strip. The cover is left on the box and this prevents contamination of the material from grit, oil, and water.

We buy these boxes by the gross in our shop for storing small parts and screws but they can also be obtained at most drug stores at a small cost.

• •

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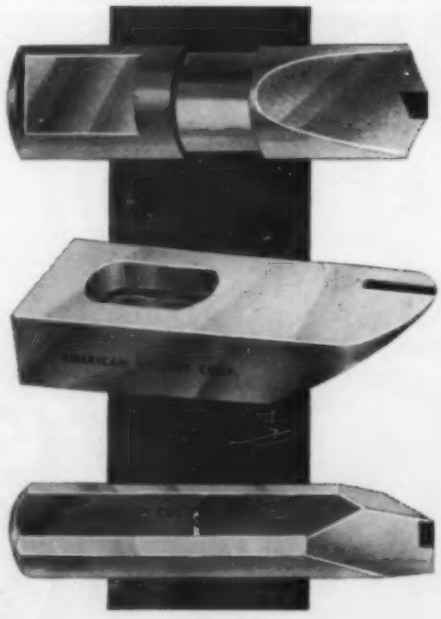

25 years ago accuracies of more than .002 inch were exceptional. Today, every diamond tipped shaped tool manufactured by the American Coldset Corporation is guaranteed to have—

- **Diamond radius as specified and concentric within .0001 inch.**
- **Centerline of radius and locating flats co-linear within .0005 inch.**
- **Matched tools with corresponding dimensions similar within ± .0002 inch.**

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PRESSURELOK-224

RESINOID DIAMOND WHEELS

— the best diamond wheel bond ever developed—
if you've used them - you know they're best!
if you haven't - let us show you!

UNITED STATES DIAMOND WHEEL CO. AURORA, ILL.

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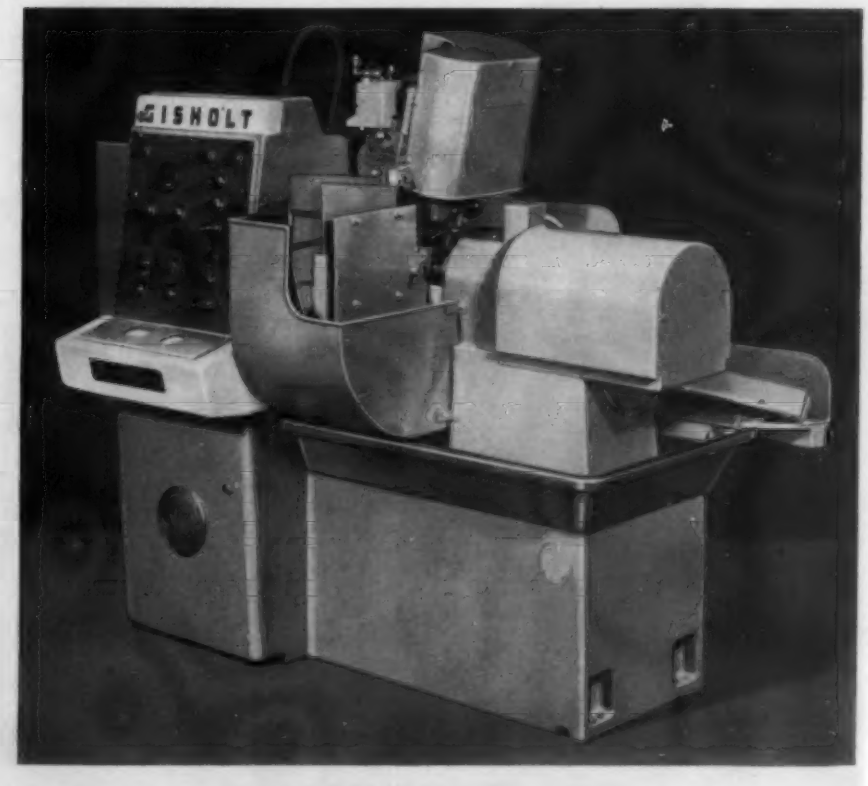
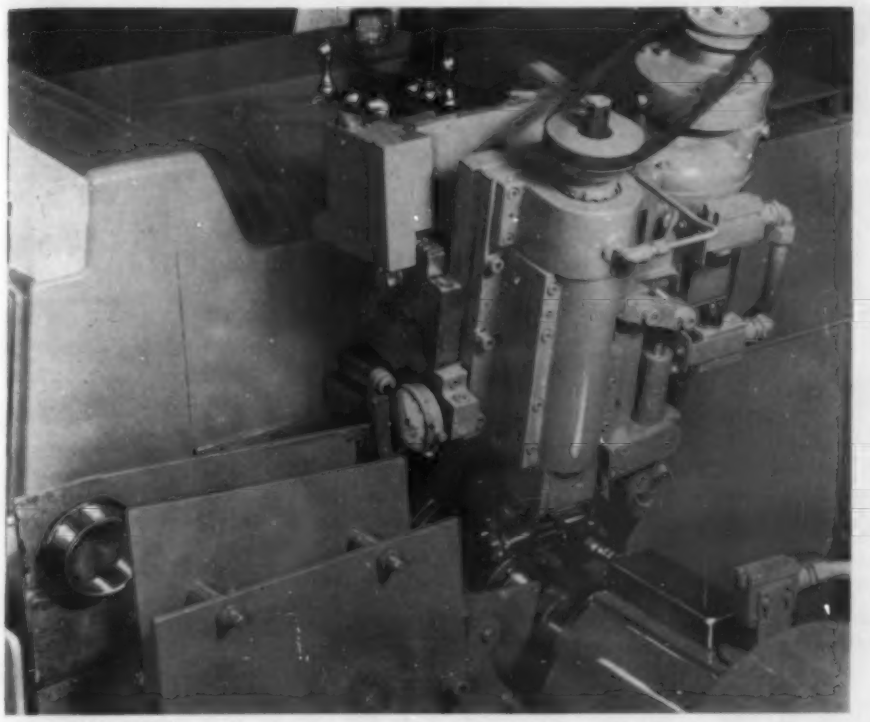
What's New in Equipment and Materials

Gisholt No. 79 Masterline Bearing Race Superfinisher

DESIGNED for high production Superfinishing of inner and outer roller bearing races or parts of a similar nature, the new Gisholt MASTER-LINE No. 79 Bearing Race Superfinisher may provide the answer to many finishing problems. Here, it is arranged to Superfinish the O.D. on inner bearing races, either straight or up to 30° included angle, in sizes ranging from 1½-in. to 6-in. o.d. Simple dial controls govern basic machine functions and simplify changeover and adjustment. These controls include a stone pressure adjustment which is adjustable from 0 to 160 p.s.i.; an oscillation rate

A general machine view of the Gisholt No. 79 MASTERLINE Bearing Race Superfinisher. All working parts are covered by guards to protect the operator. Note the dial control panel which simplifies and speeds setup. The gravity type work feeder unit may be seen.





An overhead view taken from the front of the machine. At the left and center of the photograph may be seen a rough bearing race on the gravity work feeder unit. In the center of the picture may be seen the Superfinishing quill which is retracted and the tailstock which has engaged the bearing race which is on the mandrel. The spring-loaded pins which serve to eject the workpiece are compressed at this time and the ends may be seen just above the outer rim of the bearing race. At the top center of the picture may be seen the angular adjustment arrangement and the dial indicator for final setting. The vertical adjustment handle may also be readily seen.

A view from the rear of the machine showing the Superfinishing quill engaging the work and also showing the discharge conveyor with a Superfinished part just leaving the machine. Some of the limit switch controls may be seen in the upper center of the photograph.

control which is adjustable from 0 to 2000 oscillations per minute; a spindle speed control adjustable from 0 to 1000 r.p.m. This means that the spindle speed, rate of oscillation, time for roughing and finishing cycles, are all independently adjustable by these dial controls on the headstock panel. On the standard machine the Superfinish quill unit advances and retracts for easy loading and unloading of the bearing races.

The Superfinish quill unit has 3-in. longitudinal adjustment and the screw adjustment for changes in diameter. The time cycle is adjustable from 0 to 30 seconds with the timer operating only after the stone contacts the work. The rough and finish Superfinishing cycles are set independently with calibrated dials on the control panel.

The machine features completely automatic loading and unloading, permitting one operator to handle multiple units. The machine as set up for the Show handles a steel inner bearing race, with a 12° taper and a 2⅝-in. bore. This bearing race is Superfinished from 50 to 60 micro inches down to 8 micro inches r.m.s., or less, in 25 seconds. A disc-type conveyor removes the part from a gravity work feeder arrangement and indexes it to chucking position. A tailstock holds the work against positive stops and an expanding mandrel chucks in the i.d. The Superfinishing quill descends and the stone engages the work. At the end of the Superfinishing cycle the stone and the tailstock retract and spring-loaded pins, previously compressed by the tailstock, push the part off the mandrel. The conveyor then operates and simultaneously indexes a new workpiece to the chucking position and discharges the Superfinished part to complete the operation.

Safety devices include a limit switch which will not permit the Superfinishing stone to come down and engage the work when it is worn to the point of replacement. Instead, a warning light will flash on the control panel letting the operator know that the stone must be changed before Superfinishing can occur. A limit switch on the tailstock will not let the stone come down to engage the work if the bearing is not on the mandrel. Also, the cycle will not start unless the bearing is in the loading position on the gravity work carrier. There is another limit switch which prevents the piece from being discharged if the Superfinishing quill does not retract as required.

With mist lubrication throughout, maintenance problems are kept to a minimum. ● ●

The two workpieces, one before Superfinishing and one after Superfinishing.

Field Reports on Precision's New Pink Wheel

PRECISION'S new RAA Grain wheels are actually pink! In clear Vitrified bond, the true, or actual color of the grain is imparted to the finished product. However, its pink color is not the results of efforts to be different or "showy"—the grain, different from those now on the market, is actually pink. The grain has grinding characteristics inherently different from any other grain on the market.

RAA grain is full friable aluminous oxide. It is crystalline in formation and cubical in shape and available in sizes ranging from 12 to 220 grit as standardized by the U.S. Department of Commerce.

Since the grain itself is sharper, it is claimed to cut cooler and freer, holding its shape longer on form grinding operations. Consequently, greater pressures, greater downfeed and heavier stock removal are required for maximum results. If the wheels are "babied" they tend to load and glaze. Harder grades than comparable white wheel specifications can usually be used, according to the manufacturer.

RAA wheels have performed well on all types of steels and irons for production and precision work. Their most noteworthy success has been in the field of high speed steels, especially those in the abrasive resistant class of high carbon and vanadium contents such as M3, M4, T3, T6 and T15.

More recently these same results have become apparent on the high vanadium, high chrome die steels, such as Latrobe's BR4. For grinding this class of steel, the softer grades are used for dry grinding and harder grades for wet grinding with wet operation recommended for best results. Grit sizes usually range between 46 and 60 with grades of hardnesses varying from I to M, all depending upon the operation and application.

Basically, the successful performance of RAA grain wheels stem from the sharper grain and its ability to resist dulling due to attrition resistance. The grain dissolving or diffusing into these abrasive resistant materials.

RAA grain wheels are manufactured in both Vitrified and Resin bonds in standard structure as well as Precision's 15 and 15F structure. In Resin bonds, the color is lost because of the bond's opaqueness.

Results on segments, cylindrical, centerless, internal, in large and small surfacing grinding wheels were reported as follows from field tests:

Segments—RAA46K15FV for 300 series of stainless; life, finish, cutting action—excellent.

Segments—RAA54L7V — grinding cast armor SAE 4150—.015 in. to .020 in. stock removal—excellent.

Segments — RAA36I11V — grinding shoe dies SAE 1050—up to 3/32-in. stock removal—life excellent.

10 x ¾ x 3—RAA46K8V—grinding tool bits of Vasco Supreme—T15-M3, Rockwell up to 65C. Stock removal up to 1/32-in. per side. Results—cutting action, life, finish—good. Holds size well.

20 x 4 x 10—RAA54I15FV — tool blanks of BR4 and abrasive resistant steels with .015-in. stock removal per pass. Cutting action, life and finish good. Holds size.

⅞ x 1½ x ¼—RAA80Q5V—stainless bushing 400 series hardened. Satisfactory for entire life of wheel. Dress only as required; not on automatic dresser. Eight-hundred fifty pieces average per wheel versus standard of 700.

20 x 4 x 12—RAA60N5V—Cincinnati centerless No. 2. Pistons up to 1-in. diameter, 3 to 6-in. long of SAE 52100 and M2. Rockwell 60C; .012-in. in three passes, 5 micro finish required. Cutting action, life—good. Finish O.K. Holds size.

24 x 3 x 12—RAA70M6V — Norton cylindrical. Grinding steel spindles 4-in. O.D. up to 30-in. long, .008 to .010-in. stock removal. Used on all materials including cast iron. Very good.

20 x 1 x 5—RAA9005V—Cincinnati cylindrical. Used to grind stellite No. 1 pins ¾-in. diameter, 1-in. long. Five to six pieces per dress as compared to standard of two pieces.

These RAA wheels are made by Precision Grinding Wheel Co., Inc., Philadelphia 36, Pa.

A "Double-Faced" Refractory

A "double-faced" refractory, believed the first of its kind, has been introduced for specialized use in the ceramics and abrasives industries to prevent staining of kiln fired products.

This development of Electro Refractories & Abrasives Corp., is a new type of sandwich batt, or slab, so called because the center portion and outer layers are formed like a sandwich. The original sandwich batt, developed by Electro two years ago, has a silicon carbide refractory in the center with outer layers of either zircon, mullite or aluminum oxide.

In the new slab, the center is the same, but one outer layer is of zircon while the other is of mullite. To date, it has been used for firing grinding wheels. When a white aluminum oxide wheel is fired, it is placed on the mullite face. The zircon face is used to fire a red aluminum oxide wheel. In cases where exact color must be maintained, as in ceramics manufacture, the new refractory should prove of value due to the complete elimination of staining.

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In this demonstration, men who had never before operated a surface grinder removed stock exactly to down-feed setting by following simple instructions.

How to Take the Guesswork Out of Surface Grinding!

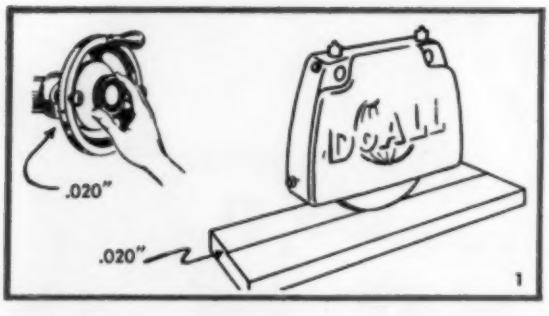
The amount of work that can be produced per hour on a surface grinder depends upon its accuracy. To grind, measure and then grind some more to secure final dimension is a costly waste of time. With a DoALL Grinder you eliminate this loss because you can trust its feed calibration *in terms of stock removal.*

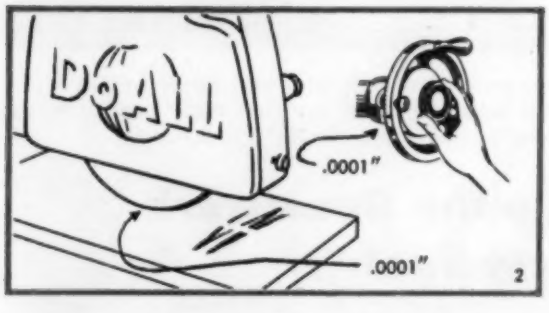
DoALL

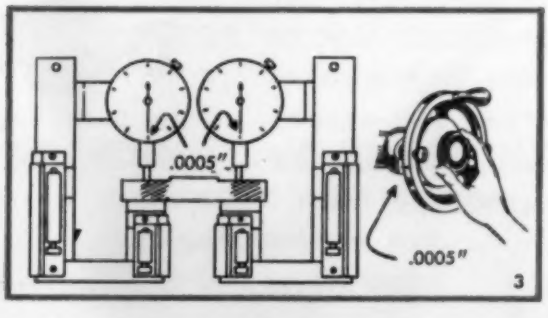
The DoALL Company
Des Plaines, Illinois

Please turn the page for details. ⟶

HOW TO TEST A GRINDER'S ACCURACY







Can Your Grinders Do This?

An accurate handwheel doesn't make an accurate grinder. And, you can't prove accuracy by checking distance from table to wheel when the machine isn't subject to the load of grinding. The real proof of a grinder's accuracy is its ability to remove stock *exactly* according to downfeed calibrations.

The following demonstration of a DoALL Grinder is conclusive proof of its remarkable accuracy:

1. No Spark-Out! Take a .020" cut with .020" crossfeed in a 2" x 3" piece of 59-60 RC hardness tool steel. Run the wheel back through the completed cut. There is no spark-out! Now, center the wheel over the work and stop the table travel. The rotating wheel will not mark the work!

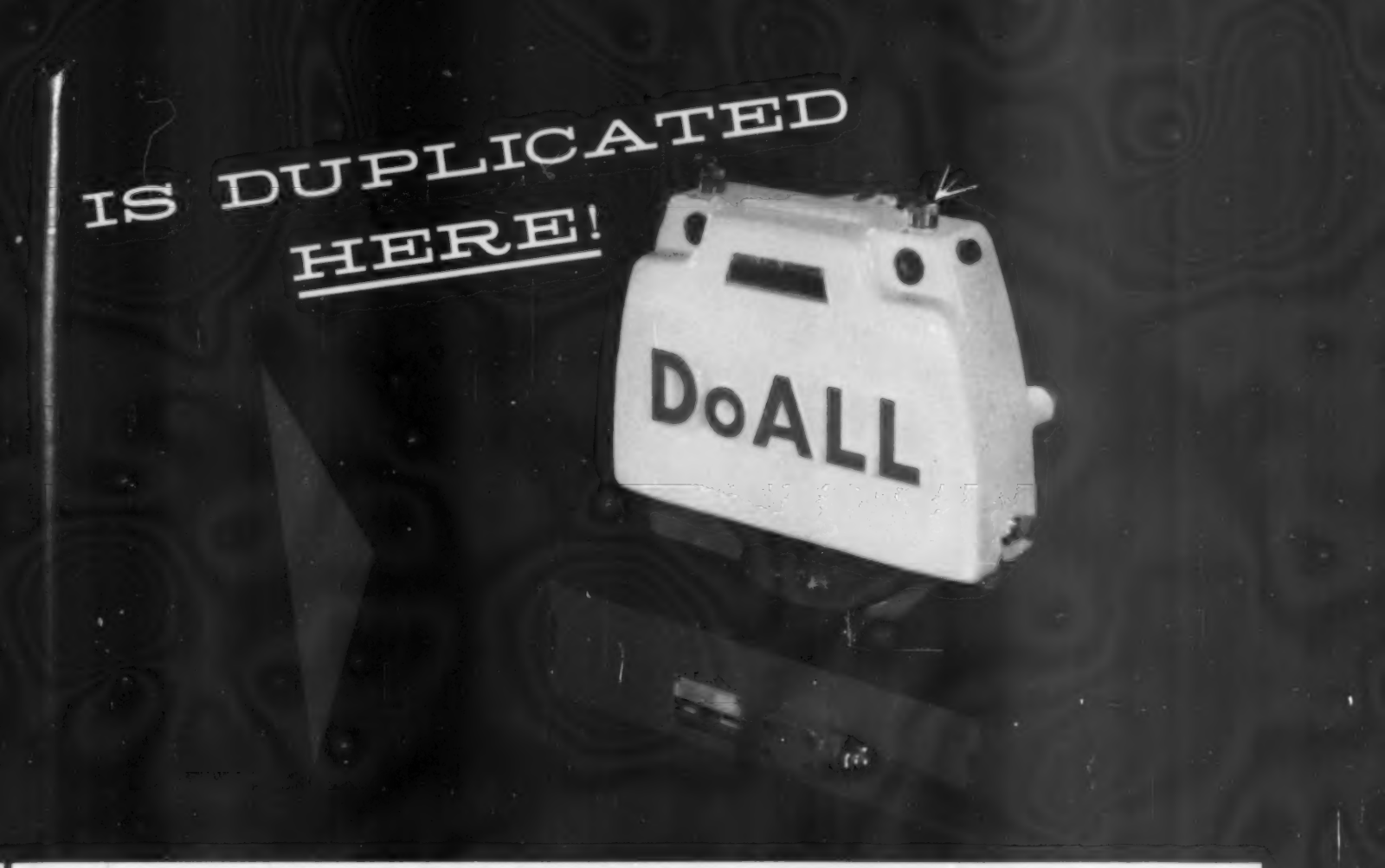
2. Erases Pencil Mark! Now, put a pencil mark across the workpiece. Start the grinder, feed down .0001" and run the wheel through the cut again. It will erase the pencil mark!

3. Duplicates .0005" Cuts! Next, set the downfeed to take a .0005" cut and grind ⅓ of the way across the width of the workpiece. Stop the machine, zero the downfeed, raise the wheel and move the table to take a cut across the opposite ⅓ of the surface. Set the downfeed to .0005" and make the second cut.

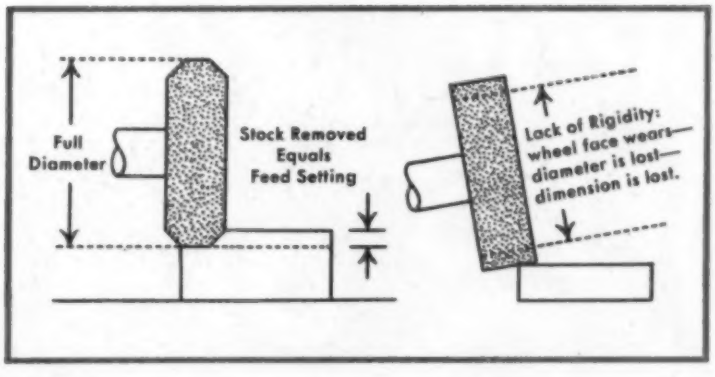
Remove the piece and check three points on each surface. All six points will check out perfectly at .0005" depth!

See this demonstration at your own plant, without obligation. Call your local DoALL Store or write to The DoALL Company, Des Plaines, Ill.

IS DUPLICATED HERE!



HOW DoALL CONTROLS GRINDER ACCURACY



"COOL-GRINDING"*
—Coolant flows through wheel.

1. Control of Wheel Diameter. This requires *rigidity* and *smooth, powerful table travel.* On a DoALL Grinder the leading edge of the wheel takes the brunt of the cutting. The wheel face and diameter remain true, assuring dimensional accuracy of work—see diagram above.

DoALL design eliminates table "gallop" which rapidly breaks down wheels. Even on the slow speeds of crush form grinding, travel is smooth and uniform because of an attachment which meters fluid from the hydraulic table drive cylinder.

Rapid cross-indexing during table reversal prevents damage to wheel resulting from contacting work during cross movement.

2. Control of Wheel-to-Table Dimension. The rigidity of DoALL Grinders prevents error-producing "give" and table deflection. Distance from table to wheel remains constant even during heavy cuts.

3. Control of Thermal Expansion. Overheating of the workpiece creates expansion that results in inaccuracy when the work cools. The optional DoALL "Cool-Grinding" and Flood Coolant Attachment provides greater and more uniform cooling than any other method. In "Cool-Grinding" coolant enters the wheel near the center through pick-up rings, flows through the pores and out in a fine mist, providing evaporative cooling at the point of cut where heat is generated. On heavy, sustained cutting, the flood cooling is used to assure uniform heat regulation of the entire workpiece.

***Certified Size, Finish, Flatness, Parallelism*—see next page** ⟶

*U. S. Patent No. 2470350

Automatic Mass Production of Precision Surfaces

Complete reliance upon handwheel settings permits production line automatic grinding without constant checking of work in the DoALL grinders.

Certified Finish, Flatness, Parallelism and Accuracy.

Every DoALL Grinder must pass critical operating tests before shipment. The machine is certified to produce a 10 micro-inch R.M.S., or better surface finish. A test block on which this has been done is shipped with the grinder. A complete inspection report accompanies each grinder attesting to the performance of every component.

Get the Facts About Faster, More Accurate Lower Cost Surface Grinding . . .

Field Demonstration.

DoALL will bring a grinder to your plant and demonstrate it in "your own backyard". You can see it and believe it—a totally new standard of surface grinder accuracy, performance, speed and economy.

LITERATURE — Ask for the new DoALL Grinder Catalog describing the design and construction of the complete line of seven models from 6" x 18" to 10" x 30".

FILMS — color, sound movies showing how you can produce more with DoALL Grinders are available for group showings. Call your local DoALL Store or write DoALL, Des Plaines, Ill.

Challenge DoALL!

—ASK FOR A DEMONSTRATION

Call DoALL for a free demonstration at your plant. Make the operator prove DoALL performance before your own eyes. You be the judge—compare DoALL performance with that of any other grinder in your plant! Call your local DoALL Store today or write. There is no obligation.

DoALL

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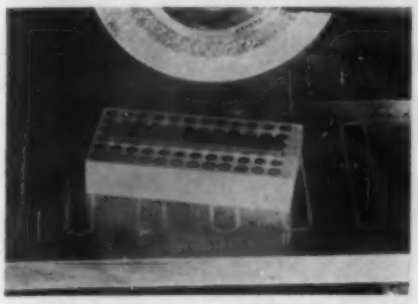
Economic Principles

$1.00 each postpaid

Lower quantity prices

Parallel Bars Protect Magnetic Chucks

Honi-Kom parallel bars, manufactured by Auburn Machine Co., 307 Chapman St., Providence, R. I., hold small, flat or irregularly shaped pieces for easy grinding or machining. They may be used in any horizontal position, on any magnetic chuck. Marketed in



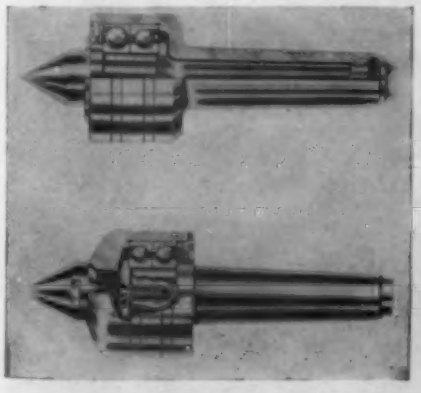
pairs, Honi-Kom parallels are said to save harmful wear on expensive magnetic chucks.

The independent core construction allows the parallels to transmit magnetic flux from its original source to the piece being ground or machined without short-circuiting the north and south poles, regardless of the angular horizontal position.

They can be used equally as well on a rotary as a horizontal chuck. Matched pairs. Size ¾ in. x 2 in. x 4 in.

Cylindrical Grinding Micro Finish with Anti-Friction Centers

A new concept in the art of cylindrical grinding to assure economical micro finish at accelerated rates of production has been advanced by Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn.



Red-E engineers claim chatter, wheelmarks and out-of-roundness are usually due to two major factors: (1) Inaccuracy of center drilled holes; (2) misalignment of center drilled holes.

Both these conditions, the manufacturer reports, cause run-out of the workpiece when rotated on solid centers.

With the introduction of two new Red-E anti-friction centers for cylindrical grinding operations these two problems are eliminated because the center point and workpiece become integral—the centers providing a positive, rigid grip in the workpiece.

Two types available, Shank and Spindle types, have exclusive bearing assembly designs, consisting of 2 matched, precision, preloaded AB5C-7 specification bearings; are of a large ball of 35 degree angular contact for maximum thrust support; the other a small ball of 15 degree angular contact for greater radial support. The bearings are locked-in and mounted D.B. for positive preloading. Lubrication is sealed-in for life with special bearing filtered grease. The Labyrinth enclosure seal is designed to protect the bearing assembly from entry of coolants.

These features plus a short overhang and high speed steel points, which are ground to 60 degrees and 15 minutes included angle, and a precision ground taper to within .0002 in. provides the necessary factors to have a run-out of less than .00005 in. T.I.R.

The Spindle type center is supported by a precision self aligning roller bearing to provide a greater radial capacity by minimizing spindle deflection.

The shank type is available in tapers 1 to 6 Morse; 5 to 14 B & S; 4 to 20 Jarno; 10 to 16 Norton; .8125, 1.335, 1.750 Landis (Large Dia.). The Spindle type is available in 2 to 7 Morse; 7 to 18 B & S; 6 to 20 Jarno; 10 to 24 Norton; and .8125, 1.335, 1.750 Landis (Large Dia.) tapers. Special heads, tapers, shanks and points are available upon request. This line is sold exclusively through industrial distributors. Literature is available.

IF YOU ARE A MAN THAT
WORKS THE ANGLES . . .
HERE'S A NEW SLANT ON
FAST ANGULAR SET-UPS
THE MAGNA-SINE
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24806 PLYMOUTH RD. • DETROIT 39, MICH.
ALSO PRODUCERS OF SPECIAL MACHINERY, GAUGES AND FIXTURES

W&B LUBRICANTS AND COOLANTS IMPROVE EVERY GRINDING JOB!

Sixty-seven solid years of *specialized experience* stand behind White & Bagley Grinding Lubricants and Coolants. Here are some of the W & B products that are *boosting production, reducing grinding costs,* and *producing better finishes* for more and more plants throughout the world:

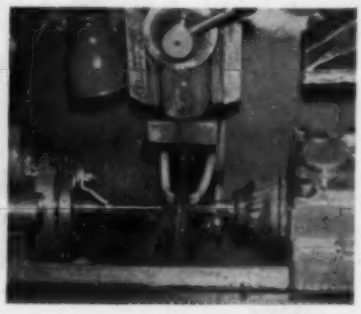
W & B Lubricant 1888 insures rapid and clean stock removal; keeps wheels open and free-cutting; permits the use of finer wheels to produce smooth finishes.

W & B Grinding Concentrate 1500 transparent and foamless; gives unusually keen grinding action and rapid chip settling; for grinding ferrous metals.

Courtesy, Norton Company

W & B Grinding Lubricant E-1 produces the highest reflective finish; permits rough grinding and finishing with the same wheel.

W & B Grinding Oil 1572 for close-tolerance, critical oil grinding; especially desirable on machines which perform a wide range of oil-grinding operations.



Courtesy, Jones & Lamson

W & B Base L adds potency (sulphur and fat) to petroleum or cutting oils to give improved results in grinding and machining.

Let us help you with *your* needs for grinding lubricants and coolants. We specialize in *your* requirements. For further information, mail the coupon today!

THE WHITE & BAGLEY CO.
Worcester, Mass. Detroit, Mich.
Originators of Grinding Lubricants

W+B INDUSTRIAL LUBRICANTS

The White & Bagley Company
Worcester, Mass.
Please send us more complete information on

☐ 1888 ☐ 1500 ☐ E-1 ☐ 1572 ☐ Base L

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Company_____

Street_____

City_____ Zone____ State_____

Encircle No. 237 on card opposite page 70

Diamond Blade For Cutting Concrete

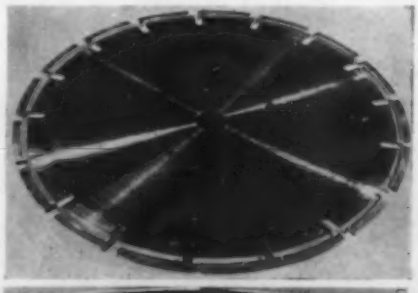
A new Diamond Blade for sawing joints in green or cured concrete has been developed by The Carborundum Co., Niagara Falls, N.Y. The new blade is bonded with tungsten carbide and called the DM190.

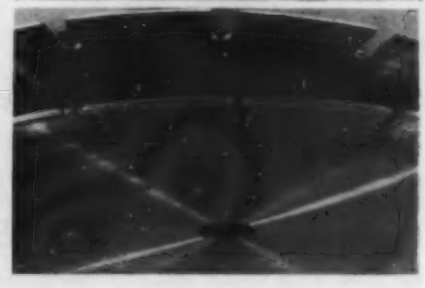
The new DM190 blade has proved its ability to cut at rates up to 10 feet per minute at a depth of 2 inches, depending on the type of aggregate used in the mix. Faster cuts can be made on limestone aggregate than tougher trap rock, quartzite, and river bottom gravel mix. Rate of cut also depends on the machine horsepower and whether it is self-propelled or manually pushed.

Excellent performance of the DM190 is due to an improvement in the design of the diamond segments (Patent pending) mounted on the periphery of the steel center. Early in the development program it became apparent that the most difficult problem to be licked was that of excess wear of the steel center directly beneath each segment. Designing the diamond segment so that a lip of wear resistant tungsten carbide overlaps the leading edge of the land reduces the wear to a point where it no longer influences the life of the blade.

Wear resistant characteristics of the new diamond segment are such that the rate of thickness loss is greatly reduced. This feature allows the blade to be used until the full depth of the diamond segment is consumed.

Diamond blades are used to cut contraction joints in concrete. The growing practice of cutting instead of forming the joints has made possible the building of concrete roads and runways in a continuous strip. Marketed by the Bonded Abrasives Division of The Carborundum Company, concrete cutting blades should be ordered by specifying diameter, thickness and arbor size or type. The complete grade is DM190.





Rubberized Abrasive Cones Have Threaded Steel Bushings

To provide greater convenience and easy operation, Cratex rubberized abrasive cones are now manufactured with threaded steel bushings. The bushing, inserted in and bonded to the cone, gives a tight union fit, cannot be pulled loose, twisted or turned. Cones screw on and off grinder spindle in seconds.

Sizes: No. 1358, 1¾" long by 15/16" diameter; No. 1359, 1¼" long by ⅞" diameter. Both are designed to fit ¼" diameter mandrel and both are made in four grit textures: coarse, medium, fine, and extra fine.

Cones clean and polish cavities, grooves, corners and other hard-to-reach surfaces, attain high polish without changing tolerances. Recommended for use on molds, dies and castings, engine ports and combustion chambers; for blending welded seams; removing heat-marks, corrosion, tool marks, fatigue lines and scratches. They easily shape to contour in operation or can be dressed to shape using conventional dressing tools. Cratex Mfg. Co., 81 Natoma St., San Francisco 5, Calif.

New 20 in. Disc Grinder and Sander

Grinder and Sander is now ready for immediate shipment according to Rankin Bros. Eng. & Sales Corp., Los Angeles manufacturers of the grinder.

This 20 in. grinder has all of the features of the standard Apex grinder: fast, easy operation; advanced safety features; long life through less maintenance. This Model 20 Disc Grinder and Sander can be used for working wood, metal, or plastic features. It is made by Rankin Bros. Eng. & Sales Corp., 11104 So. Alameda, Lynwood, California.

A single motion adjusts table up or

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Newman Grinding Wheel Dressers

now available at

Dealers Everywhere!

Protect your precious grinding wheels . . . *Particularly your diamond wheels . . .* by *truing and dressing them* with the NEWMAN GRINDING WHEEL DRESSERS.

By actual test, the NEWMAN DIAMOND WHEEL DRESSERS have proven best! Models available for Surface, Cylindrical, Pedestal and Universal Cutter Grinders.

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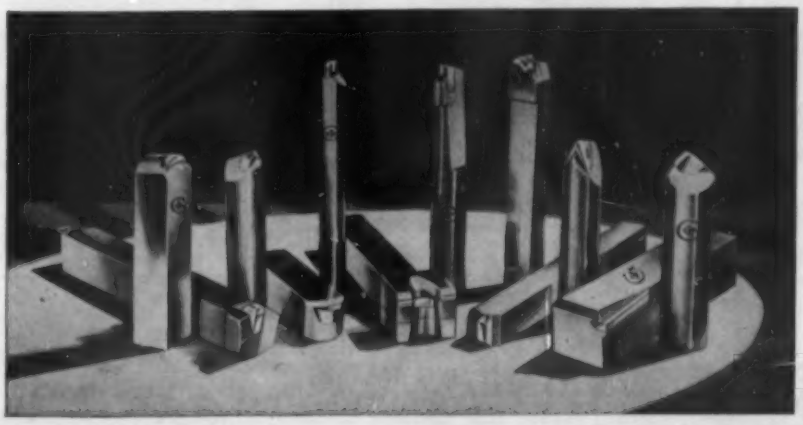
TE 2-5523

Encircle No. 238 on card opposite page 70



Diamonds for finish turning or boring plastics and non-ferrous metals. These tools are featured by quality diamonds with sharpest edges, combined with many years' experience in fitting them to perform efficiently on each operation.

Send for 36-page Illustrated Catalog No. 46

F. F. GILMORE & CO.

INDUSTRIAL DIAMONDS

126 BOYLSTON ST. BOSTON, MASS.

Encircle No. 239 on card opposite page 70

down. New counterbalanced mechanism eliminates slow, and often dust fouled, rack and gear adjustment. A reverse switch is conveniently located to speed right and left hand jobs and increase life of disc.

The unique wrap-over guard cannot flip off and tilts back simply to handle work at top of disc. Guard design plus impeller type disc actually throws dust into bag. All moving parts of grinder are life-time dry lubed. All motors are either totally enclosed or equipped with sealed bearings.

In addition, table can be tilted accurately from any 45° angle up or down—and locked into position. Once finished the table can be squared automatically.

Electrical Discharge Machining Service

Electrosize, Inc., 3910 Wesley Terrace, Schiller Park, Ill., now offers a complete custom service built around the process of electrical discharge machining, which is claimed to make possible the machining of the hardest metals quickly and economically.

Basically, the service is built around a precision method of removing metal by a series of electrical discharges operating in a coolant bath of dielectric oil. The tool (or electrode) is so constructed that the "cut" formed in the workpiece by the electrical discharges is a duplicate in reverse of the form on the tool. At no time does the tool actually touch the work since the cutting process is completely electronic.

Advantages claimed for this process include production of difficult shapes to extremely close tolerances and grinding to desired finish and tolerance without costly abrasives. Since no heat builds up in the workpiece, heat checks are avoided, and it is feasible to heat-treat before machining, to avoid distortion.

The complete service includes research and development, dies, molds, grinding, form drilling, and the production of precision parts.

Precision Barrel Finishing Contest

The 1955 Almco Supersheen Award Contest sponsored by Almco Supersheen Div., of Queen Stove Works, Inc., of Albert Lea, Minn., begins Sept. 11.

Three separate awards will be held in 1955 plus a grand prize award in each division for the best cost saving story for the year 1955. The first award will cover the period from Feb. 15 to May 20; the second from May 21 to Sept. 10; and the third from Sept. 11 to Dec. 31. Each award will consist of two separate divisions. Winning award will be $100 and second place will be $50 in both divisions.

Anyone or any company is eligible to compete for the Almco awards who is using Almco Supersheen finishing equipment.

All entries must consist of the part before finishing and the part after Supersheen finishing, accompanied by the official award entry form which can be obtained by writing to the company.

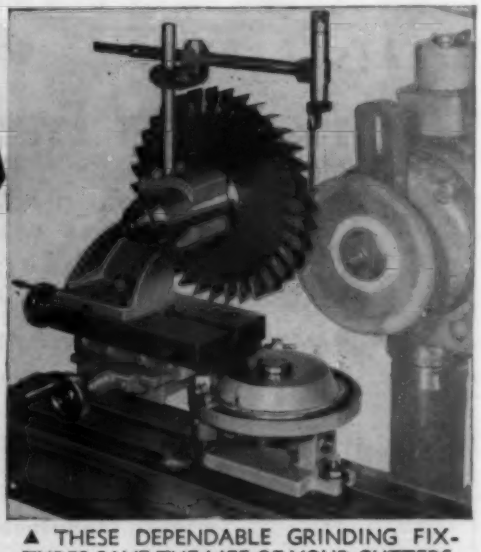
To enter, select any parts finishing problem that you have solved by the Almco Supersheen speed finishing process.

A recent winner was the LeRoy Machine Co., LeRoy, N.Y., their installation was discussed in the August issue of Grinding and Finishing.
of GRINDING and FINISHING.

THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)



▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 602

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.

▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

Encircle No. 240 on card opposite page 70

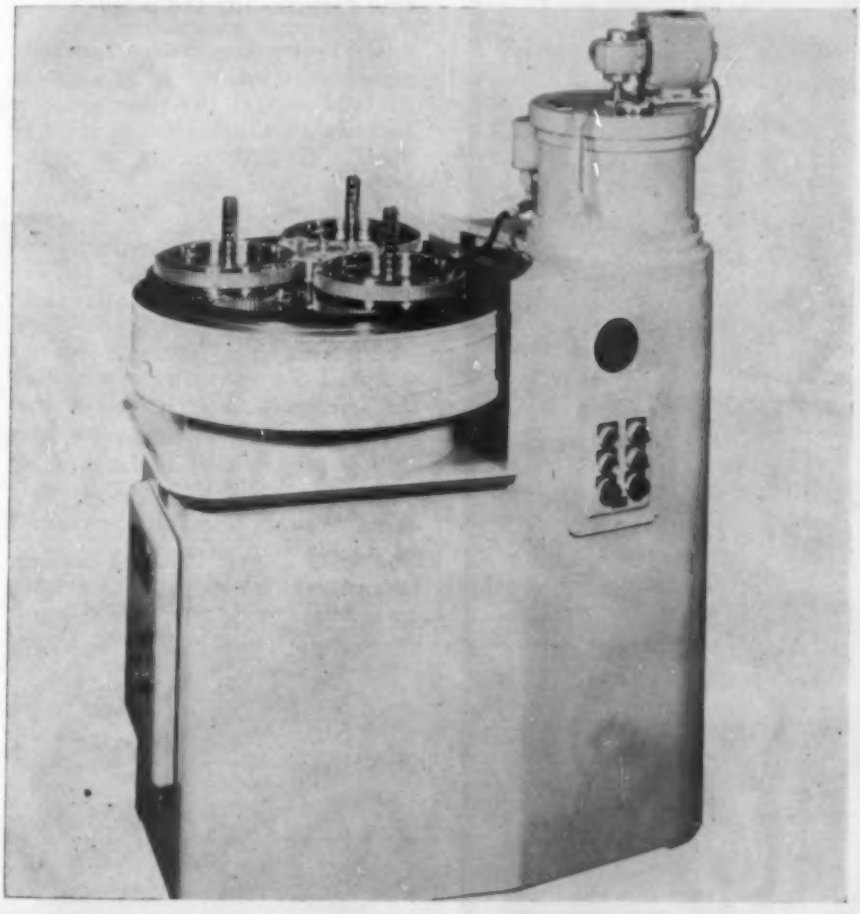
Gage Manufacturer with broad line of plain and thread gages, dial indicating gages and optical gaging equipment seeks active and qualified agents in a number of territories.

P.O. Box 3
GRINDING and FINISHING
WHEATON, ILL.

"21" Lapping Machine for Super-Fine Finishing

Completely automatic lapping to precise, super-fine finishes on small and medium parts in less time is possible with the Gyro-matic "21" Lapping Machine developed and manufactured by Spitfire Tool Co., 2931 Pulaski Rd., Chicago.

Although operating on a "push button" basis, the new "21" incorporates a unique adjustable, eccentric motion duplicating the figure eight movement used by master craftsmen in hand lapping. In operation, piece parts are positioned by laminated thermo-setting plastic nests inside specially designed, close-grained cast iron gear retainer rings. A patented Spitfire innovation rotates these parts clockwise against the counter-clockwise rotation of the lapping plate, producing truing action and providing maximum flatness of 1 light band or less. Despite a tendency for lapped parts to adhere to the lapping plate, parts removal, as well as insertion, is fast and easy. The gear retaining plate is contructed with three hinged ports which swing out permitting the gear retainer ring, nest and parts to slide off for quantity loading and unloading.



The Gyro-matic "21" is equally adaptable for either manual or automatic operation. For convenience of handling, the abrasive compound tank can be disengaged for cleaning tank, valve, feed line and visible sight gauge. A built-in neoprene agitator constantly revolves to keep abrasive grit and vehicle in correct suspension. Ball bearings support the lapping plate for exacting uniformity of adjustment, all moving parts in the gear box are permanently sealed and lubricated, and only J. I. C. electrical controls are used.

CLIPPER

PRECISION DIAMOND TOOLS

Industrial Diamonds
Thread Grinders
Turning Tools
Engraving Tools
Dressing Tools
Diamond Powder

Manufacturers of
DIAMOND TOOLS
and
WHEELS

BRANCH OFFICES

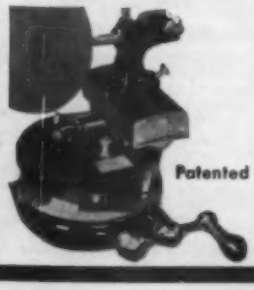
CINCINNATI, STEVE URBAN, 122 Springfield Pike
CLEVELAND, BILL WIESE, 3030 Euclid Ave.
DETROIT, FLOYD BEARSS, 1433 Northwood Blvd., Royal Oak, Mich.
INDIANAPOLIS, IVAN STRANGE, 33 Tyler Ave., Greenfield, Ind.
KANSAS CITY, MO., PENSINGER'S, 1609 Oak St.
PHILADELPHIA, H. J. MILLER, Valley Brook Rd. and Glen Mawr Dr., Ambler, Pa.
ROANOKE, VA., GEO. H. JACQUES, P.O. Box 311
ROCHESTER, N.Y., DON GINEGAW, 60 Overbrook Rd.
SYRACUSE, N.Y., BARNES & JORDAN, INC., 409 E. Jefferson St.

Representatives in Principal Cities

CLIPPER DIAMOND TOOL CO., INC.
21 E. WEST 46 STREET, NEW YORK 36

Encircle No. 241 on card opposite page 70

Patented
CONCAVE DRESSING TOOL



Patented

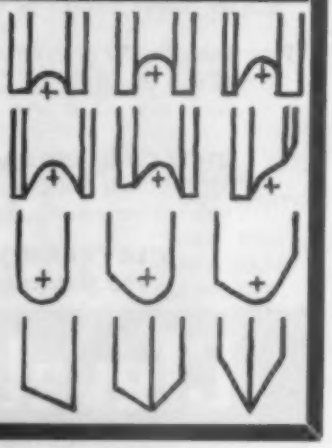
WHY WASTE TIME?

DRESS PROFILES LIKE THESE IN A FEW MINUTES without TEMPLATES or CRUSHER ROLLS

After a simple set-up the Jeon Automatic Angle Tangent to Radius Dresser will dress profiles as shown, in ONE CONTINUOUS OPERATION, eliminating the breaks in the profile at points of tangency. IT'S FULLY UNIVERSAL.

Write for Price and Folder - Dealers' Inquiries Invited

JEON MANUFACTURING COMPANY
Post Office Box 6750 Washington 20, D. C.

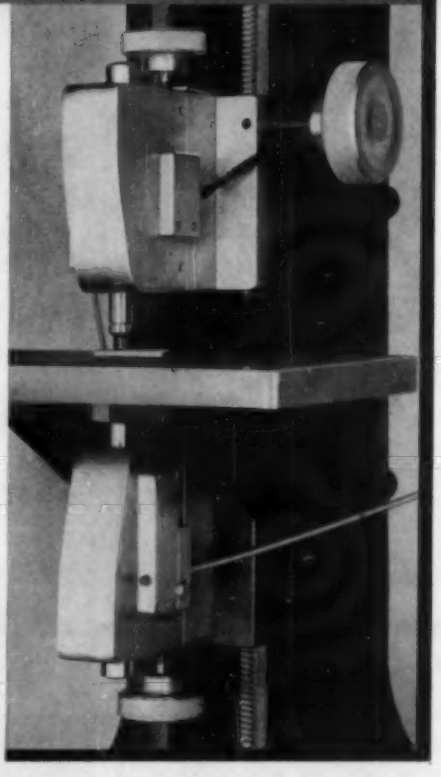


Encircle No. 242 on card opposite page 70

NEW! For checking gage blocks in millionths — or half-millionths

OPPOSED-HEAD MICRO-AC

Electronic Microcomparator



Unique Caliper Action Assures Positive Gaging. Upper gage head contacts the work in the usual way—while tip of inverted lower gage head extends through hole in table to contact underside of work. Thus the two gage heads provide *direct calipering* of the work. There's no "wringing" of the work to an anvil—no chance for error.

Two Sensitivities are provided, and are used interchangeably at will—with readings of .000010"/.000001" or .000001"/.0000005" per scale division, as ordered.

Repeat Readings within one quarter-millionth are consistently obtained, due to *frictionless gage head movement* and *drift-free amplifier.*

Free Bulletin 552 gives details. May we send you a copy?

OTHER CLEVELAND GAGING EQUIPMENT includes the versatile INDI-AC Electronic Indicator, PAR-AC Electronic Production Gage; AUTO-SORT Electronic Gaging and Sorting Unit. We invite your inquiries.

CLEVELAND INSTRUMENT COMPANY
735-5 CARNEGIE AVE. • CLEVELAND 15, OHIO

Cleveland | ELECTRONIC GAGING EQUIPMENT

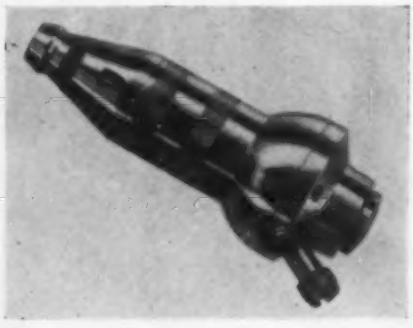
Encircle No. 243 on card opposite page 70

New Portable Tap Sharpener

The Rocket Tap Sharpener makes it possible to re-sharpen either right- or left-hand taps of two, three, or four flutes in about three minutes. It can be used on any make or any size grinder with a magnetic chuck.

It is equipped with one ½" collet, and will accommodate any standard 5-C collet of ⅛" to 1" cap. The first liner sleeve is off center to cut radial clearance on tap; the second liner sleeve is on dead center for indexing purposes. Sleeves are of carburized and hardened steel, base is of cast iron, and there is a holder for a steady-rest finger.

Available from the Rockford Die & Tool Works, Inc., 1816 Seventeenth Ave., Rockford, Illinois.



Air Grinder Develops 1/5 HP at 75,000 RPM

The haskAIR turbine-type air grinder, weighing 18 ounces and measuring 5¾ inches in length, develops 1/5 hp at 75,000 rpm.

Special features of this powerful grinder include: permanently sealed bearings which eliminate the need for lubrication in air lines or the grinder itself; removable nose piece for extra-deep grinding; lightweight, hand-fitting aluminum housing that enables pencil-like control for precise grinding jobs. Gyro-action of the turbine holds tool steady.

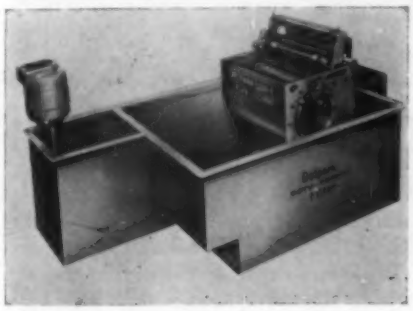
Kit contains grinder, carrying case,

adapter hose, mounted points, dressing stone and wrenches. A complete line of accessories—carbides, mounted points, cutters, files, tool post holder, air filter, air pressure regulator—is available. R. G. Haskins Co., 2651 W. Harrison St., Chicago 12, Ill.

Automatic Rotary-Gravity Type Filter

Continuous full flow filtration of coolants, cutting oils and numerous industrial fluids is accomplished with this unit. Major features are a permanent type filter screen for removal of particles to .002" in size and large flow capacity.

Unit is self cleaning through reverse flush principle operating on a time lapse sequence. Residue thus cleaned



from bar stock type screen is removed by chain driven flights.

Unit illustrated is mounted in tank to fit around base of a Cincinnati grinder. Tanks of special design and application are available. The Delpark Roto-Gravity Filter requires attention only for the removal of residue and sludge from the tote box under the carry-off shelf.

Sizes are available for capacities from 20 to 100 g.p.m. Industrial Filtration Co., Dept. R-290, Lebanon, Ind.

SAVE 60%—NEW SURPLUS BENCH GRINDERS

Rugged, precision constructed for continuous heavy duty work. Adjustable babbitt bearings. Includes tool rests. Arbor 21"x 1-1/16"x1" at ends. Takes up to 12"x 2" wheels. Two flat pulleys furnished. Immediate shipment. Weight 60 lbs. Satisfaction guaranteed. **Price only $9.95** f.o.b. Plymouth, Indiana. Send check or money order or have item shipped C.O.D. V-belt furnished if desired. Add $2.00 to cost of grinder if desiring V-belt pulleys.

CLIZBE BROS. MFG. CO.
DEPT. J, PLYMOUTH, INDIANA

Encircle No. 244 on card opposite page 70

NEW!

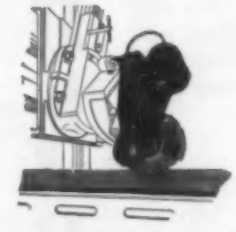
DUMORE TOOL POST GRINDER turns standard machine tools into heavy-duty grinders

YOUR PRESENT EQUIPMENT PLUS A DUMORE "25" WILL CUT YOUR GRINDING COSTS ON THE BIG JOBS

Large external grinding jobs, which have been impractical or impossible for you to do in your own plant, can now be easily and economically handled on your existing machine tools. The answer is the new Dumore Series 25 Tool Post Grinder mounted on lathes, vertical boring mills, planers, shapers and other standard machine tools.

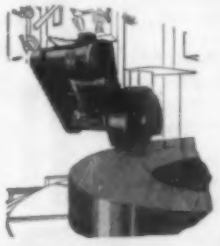
Size of the work is limited only by the machine tool itself. Mounted on a 20" or larger lathe, this powerful grinder will grind and finish all types of cylinder work such as textile and rubber printing press rollers. Motor and quill can even be turned end-for-end for back of lathe mounting. On a planer, the largest surface grinding jobs are done easily. And on a vertical boring mill, it saves hours of set-up and transfer time on normally difficult work.

The Dumore "25" is powered by a 3 H.P. induction motor that assures controlled wheel speed under the severest load conditions. Equipped with built-in magnetic starter, overload protector and greased sealed bearings. Rugged, cast iron frame built to withstand vibration. 12 inch wheel capacity.



MOUNTED ON LATHE

MOUNTED ON PLANE



MOUNTED ON VERTICAL BORING MILL

THE FAMOUS DUMORE QUILL ... HEART OF THE GRINDER

Recognized throughout the industry for its precision. Equipped with Timken precision tapered roller bearings, grease-lubricated and pre-loaded at the factory having a radial capacity of 955 lbs. and a thrust capacity of 655 lbs. Swings wheel 12" x 1½" at 1750 rpm.

WRITE FOR BULLETIN 425
For Detailed Information On The New Dumore Series 25 Tool Post Grinder

DUMORE®

AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

1326 Seventeenth St., Racine, Wisconsin

Encircle No. 245 on card opposite page 70

New Grinding Facilities Broaden Ceramic Scope

New grinding facilities at Frenchtown Porcelain Co., Trenton, N.J., are claimed to have placed more applications within the scope of ceramics than were heretofore thought practicable.

Left to right: Ultra high frequency insulating disc, o.d. 10", hole, 1" and thickness, .5". Vacuum tube envelope, o.d. 7.1875", i.d. 6.125" thickness .5". Both pieces are internally, externally and parallel surface ground by Frenchtown Porcelain Co.

In the processing of ceramic parts, it is recommended that pieces be designed for broad tolerances to help reduce costs, rejects and production problems. Thickness tolerances must allow for die fill and pressure variations during the pressing operation. The most liberal tolerance should be assigned to those parts which require threading.

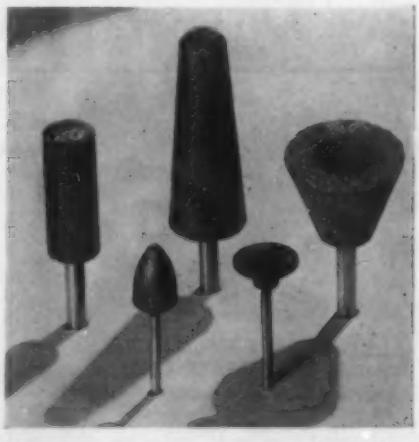
However, through precision grinding at Frenchtown, it is reported that fine tolerances can be maintained and ceramic parts are being produced to meet specifications for tolerances of ± .001". This tolerance figure applies to the external grinding of pieces up to 10" in diameter and up to 24" in length; internal grinding of diameters, .750" to 8" and lengths, .125" to 2"; grinding parallel surfaces with diameters, .250" to 5" and lengths, .055" to 4"; centerless grinding of diameters, .063" to 1" and lengths, up to 8"; and internal honing of .185" to 2.625" i.d. with lengths in direct proportion to the diameters.

In grinding high alumina ceramics, it has been found necessary to use diamond wheels and discs rather than conventional abrasives. Since these ceramic bodies predominate in aluminum oxide (corundum), some as high as 95%, they assume the physical properties of that mineral. Conventional abrasive grains, often manufactured from aluminum oxide or silicon carbide, have little or no grinding effect on the high alumina ceramics. The abrasive action is reversed, with the ceramic wearing away the abrasive, unless diamond wheels and discs are used.

High Speed Resin Bonded Wheels and Points

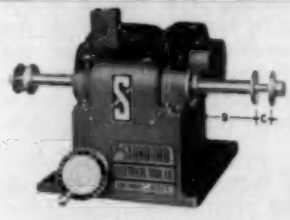
A completely new line of high speed resin bonded wheels and points, designed to operate at 20,000 rpm and above, has been announced by American Diamond Saw Sales, 120 N. W. Ninth Ave., Portland, Ore. These high speed mounted wheels afford the metal finisher, particularly the stainless steel fabricator, considerably faster cutting action and longer wheel life, states the manufacturer.

They have been used by manufacturing firms in Oregon and California for the past six years with a record of 100% continued use by every manufacturer who has had the opportunity to use them. They are now available for distribution in other areas.



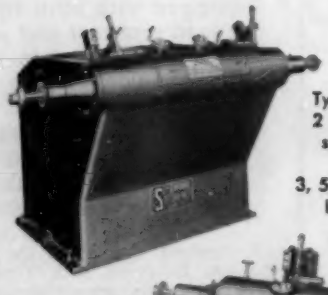
These high speed mounted wheels of aluminum oxide are coded to indicate the degree of hardness of the bond. They are available in the standard grits from 24 to 120 and sizes and shapes to conform to national standards.

FOR FINISHING TO A "STANDARD"



BVB 1 HP Bench Model

Standard Buffers and Polishers are superbly engineered for top production. "Speedial" control lets you choose speed between 1500 and 3000 RPM *instantly*. Buffing, polishing, coloring to a uniform finish by maintenance of constant peripheral speed.



Type R2V with 2 independent spindles and motors. 3, 5, 7½ & 10 HP. Larger sizes to order.

Type RV 3, 5, 7½ & 10 HP.

the STANDARD electrical tool co.

BUFFERS - POLISHERS and MACHINE TOOLS

2478 RIVER ROAD • CINCINNATI 4, OHIO

WRITE FOR CATALOGUE

INFINITELY VARIABLE SPEED, PROPER SPEED, MOTOR DRIVEN

BUFFERS — POLISHERS

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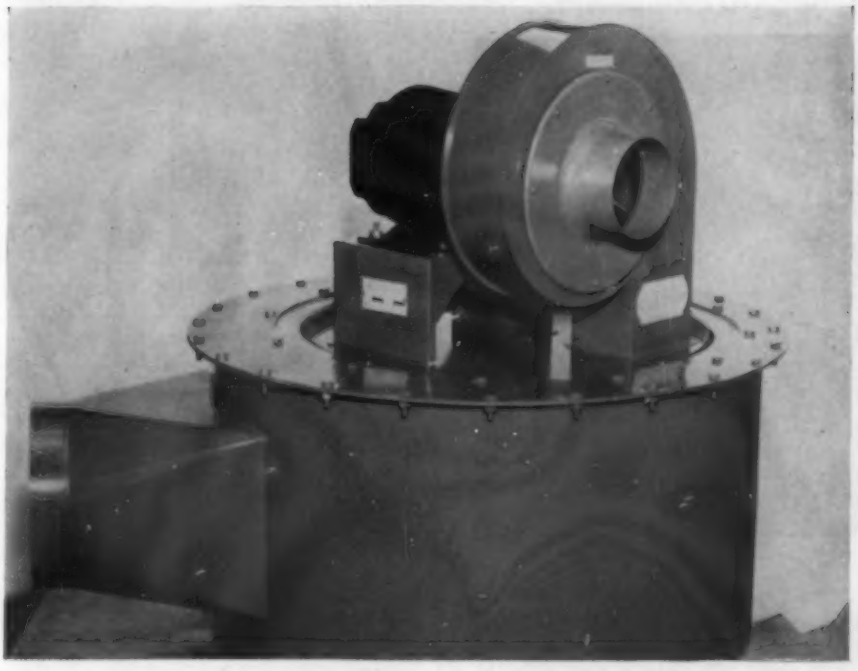


New Mist Collector Expels Smoke

A variation from their standard model of Mistkop mist collector to collect and expel smoke from oil, where heavy machine cutting is done, has been announced by Aget Mfg. Co., Adrian, Mich. The standard models, which formerly collected mist and vapors from cutting oil used as a coolant, condensing it and returning it to the machining sump, now has added an exhaust shell which effectively removes the smoke through a pipe connection leading out of doors. The exhaust shell surrounds the filter portion of any Mistkop model and is designed so that loss due to air friction is kept to an absolute minimum so that enough pressure is available in the fan of the collector to force the smoke out of doors without auxiliary fan equipment. All of the oil mist is retained in the collector to be returned to the cutting operation, thereby assuring that no outside damage to cars, lawns, outside building walls, etc., can result. Aget manufactures four sizes of Mistkop mist and vapor collectors, as well as over 37 models of Dustkop, dust collecting units.

Production Checking of Microinch Roughness Around Surfaces of Rotation

Micrometrical Mfg. Co. announces the type RE Rotary Pilotor, for taking Profilometer roughness measurements around surfaces of rotation on small parts on a production basis. Surfaces of 1/32" to 2" radius or more may be measured, depending on the size of the part; and tracers can be furnished to reach surfaces in parts of almost any shape.

This unit has a belt-driven spindle from a gear motor in the Pilotor housing. The work-piece is held in an adapter, which in turn is held in the spindle. The adapter locates the center of rotation of the work surface on the axis of the spindle and the work surface moves past the tracer point of a stationary tracer at a speed of 0.1" per second. Change pulleys can be furnished to provide the same tracing speed for surfaces of different radius. Reciprocating rotation through any desired arc from 10° to 350° is selected by two adjustment rings on the spindle, which are clamped by respective thumbscrews. By leaving both thumbscrews loose, continuous rotation is obtained. Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich.

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use $89.95

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

333 Nassau Avenue Brooklyn 22, N. Y.

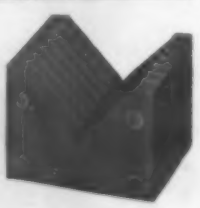
Encircle No. 247 on card opposite page 70

MAGNETIC CHUCK

PARALLELS and "V" BLOCKS

No.	Size	Matched Pair
IP2	1x2x2	$16.50
IP3	1x2x3	19.50
IP4	1x2x4	22.50

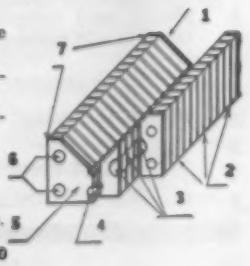
No.	Size	Matched Pair
IV2	1¾x2½x2	$22.50
IV3	1¾x2½x3	33.75
IV4	1¾x2½x4	45.00



Price includes Hardwood Box Patent Pending

Distributed Nationally by GROVER-SAYLE CO. PV Div. P.O. Box 6715 Cleveland, Ohio

1. "V" in "V" block ground parallel to base and centered.
2. Spring-temper, phosphorus bronze non-magnetic laminations.
3. Positive, mechanical lock, non-shift laminations. Patent pending.
4. Dowels welded to end plates.
5. End plates ground square.
6. Five hard temper silicon bronze dowels.
7. ⅛" end plates welded and ground square.



Encircle No. 248 on card opposite page 70

NEW BELT GRINDER with built-in "conveyor" grinds up to 14,000 SMALL PARTS AN HOUR!

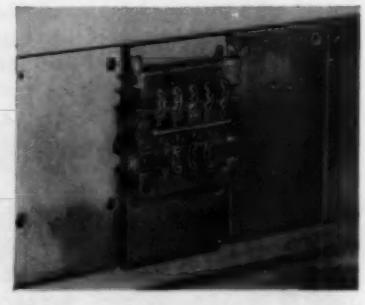
ENGELBERG

BG-8 AUTOMAT

for mass production of small parts

● The "conveyor" on this new Engelberg Porter-Cable wet-dry belt grinder is an automatic continuous work feed device with 21 fixture plates. These plates travel across the face of the 8" abrasive belt at speeds of 1090, 1350 or 1750 per hour. Depending on the number of pieces loaded on each plate, an operator can grind up to 14,000 or more small parts an hour.

Loading of each fixture is manual—ejection can be automatic. Work is advanced quickly to the belt surface, is fed slowly into the abrasive during its passage across the belt, is retracted quickly before leaving the belt. The finish is a straight-line finish with an accuracy of ±.0005" to ±.001".



● Close up of fixture plate capable of holding 10 small valves . . . one of the many ways large quantities of small parts can be mounted.

MAIL COUPON FOR FULL DETAILS

THE ENGELBERG HULLER CO., INC.

The Engelberg Huller Co., Inc.
329 Seneca St., Syracuse, N. Y.

Please send complete information on new BG-8 Automat Abrasive Belt Grinder and name of nearest distributor.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

Encircle No. 249 on card opposite page 70

Spindles Convert Boring Mills to Grinders

The Precision Spindles produced by The Standard Electrical Tool Co., 2488 - 96 River Road, Cincinnati 4, Ohio includes a wide range of grinder attachments for converting Vertical Turret and Boring Mills into Vertical Chucking Grinders.

The illustration is of a package-unit which instantly converts a 36 in. Vertical Turret Lathe into a Rotary Grinder. This is illustrated with a 3 hp, 3600 rpm totally enclosed precision motor with variable ratio on the belt drive to deliver the correct spindle speed for a wide range of internal and external grinding wheels. The design provides for a minimum of effort in interchanging the Vertical Turret Lathe from metal cutting to grinding, or vice versa.

This Series 1937 assembly shows the extension type of Precision Spindle and also an interchangeable spindle with an internal taper to accommodate removable Quills of various dimensions to serve small hole grinding.

Flute Polishing Wheel

A new Sawco abrasive wheel has been developed, claimed to speed up polishing of the flutes of taps and drills. It is made by the Sandusky Abrasive Wheel Co., Sycamore, Ill.

The wheel is rubber bonded. It may be easily dressed to fit the contour of the flute it polishes. The self-dressing action of the bond automatically maintains the proper wheel shape, reducing the amount of dressing necessary and permitting faster polishing since there is a maximum of abrasive in contact with the metal at all times.

Available in diameters up to 10" with face thicknesses to ½". Arbor diameters range from ¼ to 1½". The wheel may be run at 8000 sfpm.

New Cut-Off Machine Provides Smooth Finish, Squareness

Lombard Governor Corporation of Ashland, Mass., announces a new Bullard Abrasive Cut Off Machine, for use in any plant where metals and nonmetallic materials are cut.

Machine cuts 2½-in. dia. solids, 4-in. outside dia. tubing, 4-in. angles, or 6-in. channels. Use it either wet or dry, depending on the material being cut.

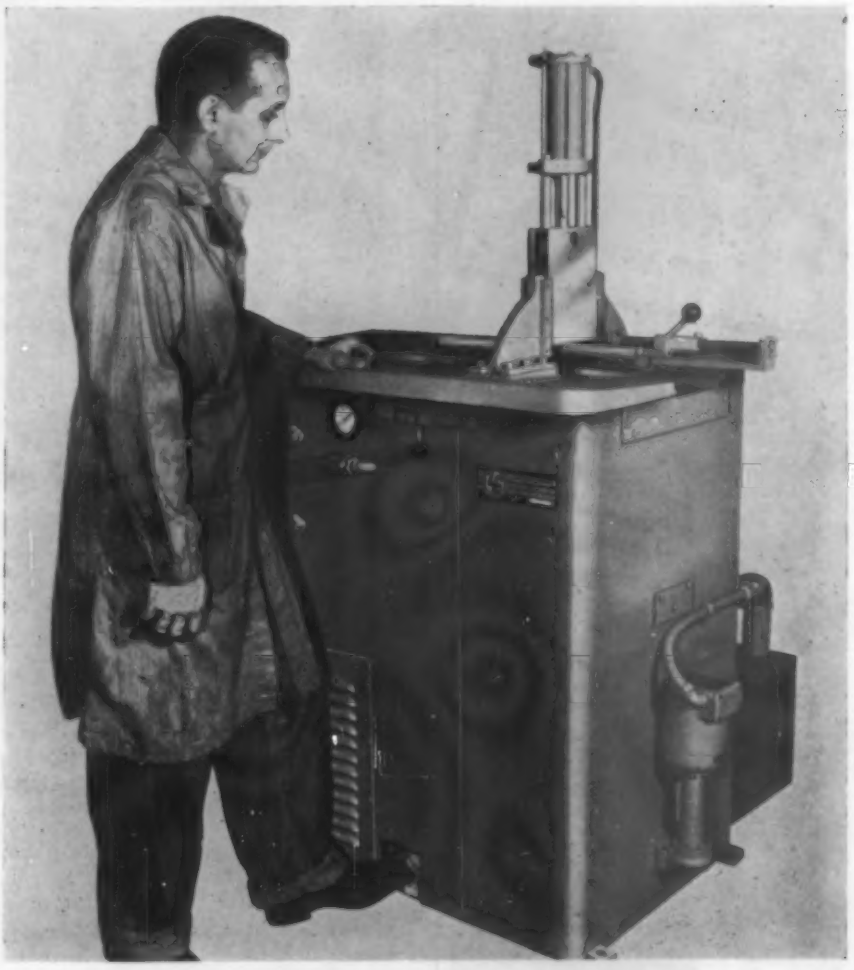
An axial air-gap motor drives the wheel at surface speeds up to 13,500 fpm. and finishes sufficient flywheel effect to prevent appreciable slowing down of the wheel in cuts, thus preventing burning or scoring of the material. It also provides extremely smooth finishes and accurately square cuts. Combining the smooth finish and squareness of the ends with the ability to repeat cuts to lengths within the usual fractional tolerances means that, in many cases, no further finish will be required.

The cut-off wheel is completely enclosed.

Dual Clamping Plates are used to hold the material on both sides of the cut.

Wheel travel, clamping plates, and the cover are all operated by means of double-acting hydraulic cylinders.

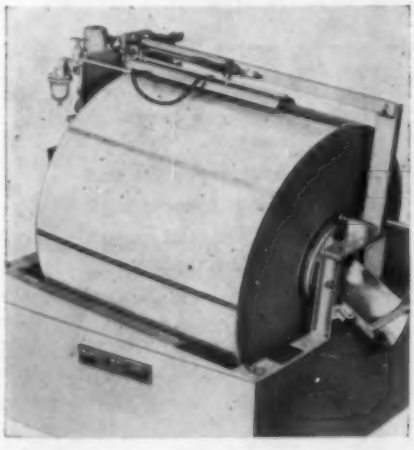
Lombard Governor Corp. is prepared to design machines to meet special applications as well as semi-automatic and automatic machines.



Improved Industrial Filter

The Murray-Way Corp., Dept. GF, of Birmingham, Mich., have developed an improved automatic filter for all types of industrial filtration.

Known as the Model 10, this filter



features basic improvements in the removal of the contaminant, elimination of tuning rods, and an enlarged filtering area.

The filter automatically rotates fresh filtering area into position while simultaneously ejecting the contaminated cake. Filtering screen is divided into eight equal parts—screw-mounted. Filter screen material and size of screen opening can be supplied in monel, stain less steel, brass or bronze to fit all requirements.

Contaminant retained on the filter screen is removed by air pressure and is dropped directly into the exit chute. Through the filter float control the air unit is actuated only when the drum turns. That operation occurs only when the contaminant cake restricts filtering and the liquid level rises to operate the float control.

Elimination of the tuning rods permits the enlargement of the filtering area approximately 15% without enlarging the small floor area already occupied.

The Murray-Way Filter may be used on an individual machine unit, or as a central filter for many units. The gallon capacity of filtration may be easily increased by adding filter drums in tandem—separately, or in the same tank to meet requirements.

New Production Methods and Machinery Shown in Coated Abrasives Film

"Coated Abrasives Belts Speed Metalworking Production" is a 27-minute sound-and-color close-up (104 application scenes) of the newest finishing developments in coated abrasives technology. The methods, machinery and product application shown give an up-to-date problem and solution session aimed at cutting finishing cost per piece.

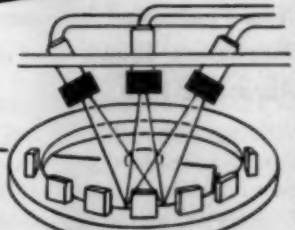
Applications include off-hand contour and standard lathe work but concentrate mostly on semi-automatic and automatic operations. Work materials are ferrous, nonferrous and nonmetallic; shapes include contour, cylindrical, flat and sheet products. Prepolishing techniques are strikingly demonstrated. Film prints (16 mm, sound, color, 27-minutes) are available to foremen groups, plant production training classes, technical societies and college engineering and trade school groups, on application to: Dept. FI, Behr-Manning Division, Norton Co., Troy, N. Y.

which of these
POLISHING
PROBLEMS
are yours?

CHECK*

- ☐ Reduction of belt sanding stages
- ☐ Cutting down buffing time
- ☐ Reduction of hand polishing
- ☐ Blending directional grind lines
- ☐ Lowering micro-inch finishes
- ☐ Exposing cracks and fractures
- ☐ Smoothing belt marks
- ☐ Imparting non-directional finishes
- ☐ Semi-reflective surfacing
- ☐ Blending brush marks
- ☐ Surface uniformity
- ☐ Removal of stress marks
- ☐ Obliterating
  - ☐ Scores ☐ Tool marks
  - ☐ Reliefs ☐ Chatter
  - ☐ Pits ☐ Scratches
- ☐ Matte finishing
- ☐ Thread fit and turnability

OR



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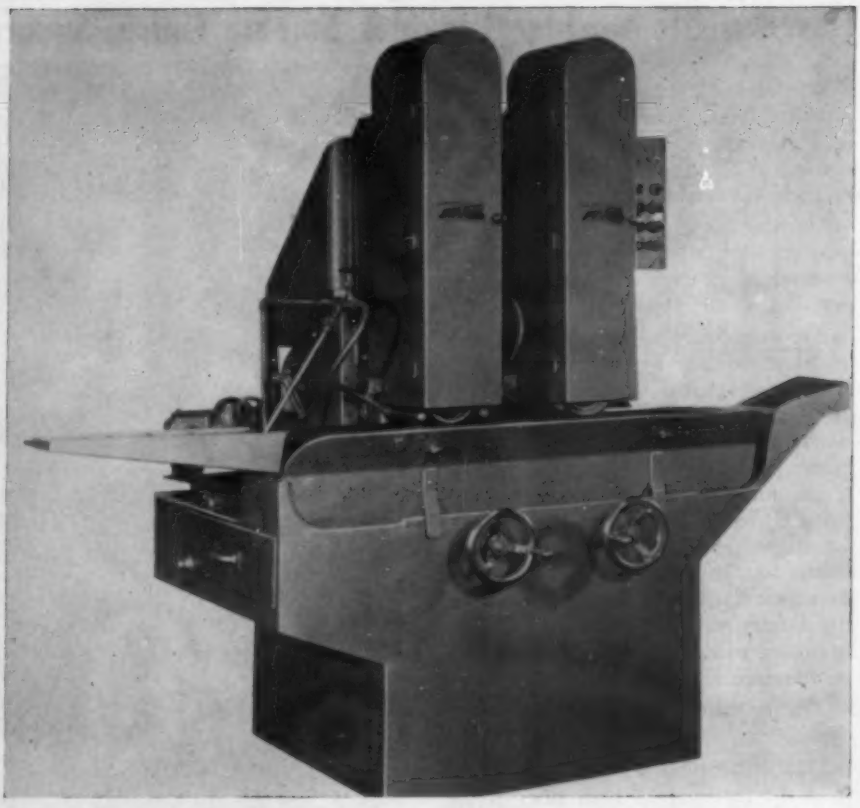

Multiple Head, Conveyor-Type Belt Grinder

A new multiple head, model 680, conveyor type abrasive belt grinder has been introduced by the Engelberg Huller Co., Syracuse, N.Y. This semi-automatic grinder is designed for wet or dry grinding and polishing of ferrous, non-ferrous, plastic and other materials. It is especially suitable for grinding and deburring flat surfaces of these materials on a high production basis.

Conveyor belt is changed in less than five minutes; belt tension is adjusted by a simple twist of the handle. Quick manual adjustment of conveyor belt speed is obtainable for settings from 5 to 30 fpm. Extra operator safety is assured since the machine won't start unless the belt is tensioned.

Model 680 is 90-in. long, 51-in. wide and 90-in. high with an abrasive belt size of 6-in. x 80-in. Conveyor belt size is 7-in. x 144-in. Abrasive belt speed is 5500 sfpm while speed of the conveyor belt varies from 5 to 30 fpm. Maximum piece capacity is 4-in. high, 6-in. wide, any length.

Available with single, double or any number of heads and 5 or 7½ hp. drives. Magnetic chuck is optional.

Diamond Saver Adds to Life of Wheel Dresser

A new diamond saver for use on the J & S "Fluidmotion" Wheel Dresser has been announced by J & S Tool Company, Inc., 87 Dorsa Ave., Livingston, N. J. Standard on all new production models of the "Fluidmotion" Dresser, the saver is also available independently for attachment to those models already in the field. The saver itself consists of a tapered "Vee" that permits rotation of the diamond at the negative angle.

With this tool, the diamond may be revolved to utilize its sharpened edges; as a flat develops on the wear side, the diamond is simply revolved to a sharper side, although it retains the original concentricity to the shank.

Tool Grinder Has Profile and Tool Positioning Attachments

A tool grinder equipped with attachments for carbide tipped and high speed steel tools is being manufactured by the Redco Tool Div. of the Red Lion Cabinet Co., Dept. GF, Red Lion, Pa. The profiler, yoke and profile single tool attachments make the grinder equally effective in re-sharpening standard production tools and making and re-sharpening special types of cutters. The profile attachment with its template and guide enables the maintenance of tolerances as close as .0002" on the cutting edge, it is claimed.

Encircle No. 250 on card opposite page 70

News of the Industry

Cincinnati Milling Buys Heald

Frederick V. Geier, president of The Cincinnati Milling Machine Co., announced today that the plant of The Heald Machine Co., Worcester, Mass., had been acquired for cash by a subsidiary of the Cincinnati company.

Heald is a well-known builder of precision boring machines, internal grinders and rotary table surface grinders. None of these machines are produced by the Cincinnati company.

Heald product will continue to be built and sold by The Heald Machine Company organization, with Richard A. Heald as board chairman and Carles F. Roby as president. Mr. Roby has been a vice president and director of The Cincinnati Milling Machine Company.

For the six months ended June 30, 1955, Heald shipments amounted to $9,700,000, and operating earnings, after taxes, are estimated at $185,000. On August 1 the backlog of unfilled orders was $11,000,000.

Carl Roby

Product Responsibility For Man-Made Diamonds

Responsibility for commercial development of the process for manufacturing man-made diamonds, recently announced by the General Electric Research Laboratory, has been assigned to the company's Carboloy Department, Detroit, K. R. Beardslee, general manager, revealed.

According to Beardslee, his department will in the next few years, bridge the gap between the laboratory and the production line in an effort to make these diamonds available to American industry.

Future commercialization of these industrial diamonds, he indicated, would give U.S. industry an independent, domestic source for this strategic material.

The Detroit G-E unit was given the assignment on the basis of its many years of metalworking experience associated with cemented carbides, its major product.

Texaco Opens Technical Service Office in Pittsburgh

Frederic H. Holmes, vice president in charge of The Texas Company's Research and Technical Department, announced that Texaco will expand its specialized services to industry by opening a Technical Service headquarters in Pittsburgh, Pa. The office will open September 1 under the direction of **J. C. Van Gundy.** The address will be Room No. 5—South, Building No. 1, Gateway Center.

"The new office will provide a technical service center for the iron and steel and aluminum industries, and other manufacturers in the area," Mr. Holmes said. "The specialist services of Texaco's technical organization, as well as the Company's extensive research facilities, will now be more immediately available to this important industrial section."

Joseph T. Vinbury

Walter P. R. Sceeles

Charles J. Wallace

The Abrasive Machine Tool Co., Dexter Rd., East Providence, R.I., manufacturers of precision grinding machines, announces that **Walter P. R. Sceeles** has been promoted from sales manager to assistant to the president. **Joseph T. Vinbury,** formerly advertising and sales promotion manager of The New Britain Co., New Britain, Conn., will be the new general sales manager.

Tupes of Saginaw, Inc., has been named distributor of grinding wheels to the Bay City-Saginaw, Mich., area by United States Rubber Co.

Fred W. Ely retired from the Norton Company's sales staff at the end of 43 years of service to the metalworking industry. For the last ten years he was Northeastern District Manager.

In the reorganization of sales districts following Mr. Ely's retirement, **Ronald W. Price** was named District Manager for abrasive sales in all New England states. **Robert H. Langdon** has been appointed District Manager for a new sales district which includes New York State and northern New Jersey.

John W. Wheeler of Newington, Conn., has been appointed an abrasive engineer in the Western Massachusetts area, succeeding Robert H. Langdon.

Charles J. Wallace has been elected vice president and general sales manager of Houdaille-Hershey of Indiana. The company also announced the appointment of **J. L. Montmarquet** as export manager; his headquarters will be in Ridgefield, N.J.

Earl B. Whitt has been named sales engineer in the mid-Atlantic territory for the Engelberg Huller Company, Inc., Syracuse, New York, manufacturers of abrasive belt machinery, announces John T. Schenck, company president. His new territory will include Maryland, Delaware, New Jersey, eastern Pennsylvania, and metropolitan New York City.

J. D. Kraeger has been named sales engineer in the west coast territory which will include Washington, Oregon, California, Nevada, Idaho and Arizona.

Arthur E. Darcy has been appointed manager of the machine methods department of the Coated Abrasives division of The Carborundum Co. Several other appointments have been announced by the company. B. M. Day, manager of advertising, announced the appointment of **Joseph A. Mark** to the advertising staff. **William A. Muttitt** will be film supervisor of the public relations department and Garth McLeod will be in charge of the technical articles section of the public relations department, according to an announcement from J. Dent Lackey, public relations manager.

John M. McCarthy has been appointed district sales supervisor of the Coated Abrasives division of Armour and Company, R. L. Reeves, division general manager, announced. Mr. McCarthy's territory covers the central Chicago metropolitan area.

Ronald W. Price

Robert H. Langdon

John Wheeler

Hugh J. McKane

Elden L. Auker, general salesmanager of Bay State Abrasive Products Co., announces three appointments: **C. A. Ahlstrom** is new district manager in the Philadelphia region. He will supervise Bay State's sales activities in Eastern Pennsylvania, Southern New Jersey, Delaware, Maryland, Washington, D.C., and Virginia; **Ben Guy** becomes sales engineer in the West Coast district; **Hugh J. McKane** becomes district manager of the Southern area which encompasses North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma and Texas.

C. A. Ahlstrom

Ben Guy

Charles A. Wallace has been appointed manager of the Industrial Filtration Division of the United States Hoffman Machinery Corporation, according to announcement by Revis L. Stephenson, vice president. C. A. Wallace was formerly assistant division manager.

Marquard J. Anderson has been named a vice president of the Aro Equipment Corp. of Bryan, Ohio. For the past three years he served as assistant to the president. **J. R. Markey** has been named a director of the company. **Norman J. Sine** becomes division manager for Western Missouri, making his headquarters in Kansas City, Mo.

Houdaille-Hershey of Indiana, Inc., has appointed **Frank D. Skelley** to the position of Contract Liaison Manager. From his headquarters in Ridgefield, N.J., he will handle government contracts and special assignments. Prior to his promotion, Mr. Skelley was the company's sales representative in the New York area.

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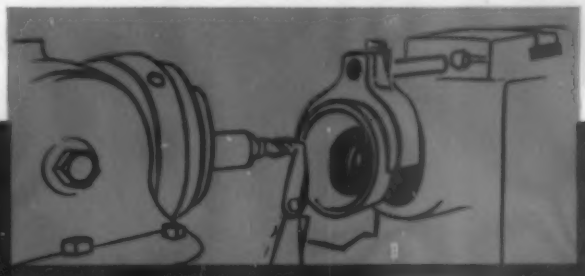

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